OAH Docket No. 12-2500-10956-2
MPUC Docket No. P-442, 5231, 3167, 466, 421/C1-96-1540

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of a Generic Investigation of U S West Communications, Inc.'s Cost of Providing Interconnection and Unbundled Network Elements

REPORT OF THE
ADMINISTRATIVE LAW JUDGE

November 17, 1998

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The above-entitled matter came on for hearing before Administrative Law Judge Steve M. Mihalchick on April 20 – May 6, and July 22, 1998. The record was closed upon receipt of the final reply brief on August 31, 1998.

APPEARANCES

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Based upon the record herein, the Administrative Law Judges makes the following:

FINDINGS AND CONCLUSIONS

BACKGROUND

1. Section 251(c) of the Telecommunications Act of 1996 (Act) requires incumbent local exchange carriers (ILECs) to provide entrants with interconnection, access to unbundled network elements (UNEs), and collocation "on rates, terms and conditions that are just, reasonable and nondiscriminatory . . . ." Section 252(d) requires State commissions to set nondiscriminatory prices based on cost "without reference to a rate-of-return or other rate-based proceeding." These prices may include "a reasonable profit."

2. On December 2, 1996, the Minnesota Public Utilities Commission (Commission) issued an ORDER RESOLVING ARBITRATION ISSUES AND INITIATING A U S WEST COST PROCEEDING, Doc. Nos. P-442, 421/M-855, P-5321, 421/M-909, and P-3167, 421/M-729 (Consolidated Arbitration Order). That Order commenced this proceeding to establish the prices at which U S WEST Communications, Inc. (U S WEST) would provide interconnection, collocation, and unbundled network elements (UNEs). The Consolidated Arbitration Order also directed that this proceeding address the issues of deaveraging UNE prices on the basis of geographic cost differences, and temporally deaveraging call transport and call termination prices. At various places in the Consolidated Arbitration Order, the Commission indicated its approval of TELRIC (Total Element Long Run Incremental Cost) methodology for determining the various prices. [1]

3. By its NOTICE AND ORDER FOR HEARING of March 12, 1997, the Commission referred the proceeding to the Office of Administrative Hearings for hearing before an Administrative Law Judge (ALJ). The Commission specified that the proceeding was to investigate the costs of UNEs, unbundling, collocation, interconnection, access to operational support systems (OSS), call completion services, directory assistance, interim number portability, and such other issues as the ALJ determined were appropriate. In addition, the Commission directed the proceeding to consider both geographic and temporal deaveraging.

4. In 1997, the Legislature amended Minn. Stat. § 237.12 by adding subdivision 4. Subdivision 4 requires that prices for interconnection and network elements for telephone companies with more than 50,000 access lines be based on:

> a forward-looking economic cost methodology which shall include, but is not limited to, consideration of the following:
>
> (1)the use of the most efficient telecommunications technology currently available and the least cost network configuration, given the existing location of the incumbent

[1] See, e.g., Consolidated Arbitration Order at 61, n.9, 67, and 74.

telephone company's wire centers;

(2)forward-looking depreciation rates;

(3)a reasonable allocation of forward-looking joint and common costs;

(4)forward looking cost of capital; and

(5)Minnesota tax rates, and where applicable, Minnesota facility placement requirements, Minnesota topography, and Minnesota climate.

The amendment was effective May 31, 1997, and was made applicable to all matters pending as of that date. [2]

5. On October 22, 1998, the FCC adopted its Fifth Report and Order, ***In the Matter of Federal-State Joint Board on Universal Service Forward-Looking Mechanism for High Cost Support for Non-Rural LECs***, CC Dkt. Nos. 96-45 and 97-160 (Fifth Report and Order), adopting the model it will use for estimating forward-looking costs for the federal Universal Support mechanism. The federal platform will be a continually evolving model that is a blending of the HAI, BCPM, and the Hybrid Cost Proxy Model (HCPM) developed by its own staff. Some of the findings in the Fifth Report and Order are instructive and will be noted in this report.

THE UNE MODELS

THE RLCAP 4.0 MODEL

6. U S WEST filed 16 models in this proceeding covering outside plant, switching, interoffice transport, signaling, and operations.[3] Loop and drop wire investments are estimated by U S WEST's Regional Loop Cost Analysis Program (RLCAP) Version 4.0. [4] RLCAP has been updated and revised substantially over the course of this proceeding. U S WEST also offers the BCPM model and its results, but only as a "qualitative and quantitative check and balance" for the investment results of RLCAP.[5] The company does not suggest that BCPM be used to calculate the cost of UNEs because BCPM models "total service costs," not UNE costs.

Overview

7. RLCAP calculates the investments for loop and drop wire by applying investments (developed from standard engineering loop designs) to loop lengths. [6] The number and estimated lengths of loops are the principal cost drivers in RLCAP. The number of working

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[2] Minn. Laws 1997, ch. 223, § 28.
[3] Ex. 603 at 8-9.
[4] Ex. 621 at 19; Ex. 122.
[5] Tr. Vol. 6 at 79.
[6] Ex. 264 (U S WEST cost studies) at 1.1.

loops served by a switch determines the wire center group to which those loops belong. RLCAP models four wire center groups. The lengths of all loops belonging to each specific wire center group provides the length occurrence profile for that wire center group.

8. Loops of various lengths are associated with occurrences of different types of distribution areas. RLCAP uses five distribution area designs or density groups. These five designs are assigned occurrence probabilities at various loop intervals for each of the four wire center groups.

9. The costs of constructing each of the five density groups is divided by the number of working lines each design provides to yield a single average cost per line for each density group. To compute costs at the wire center level, each density group's average line costs are multiplied by the number of loops of each length interval as well as by the probability of the density group's occurrence at each loop length interval.

10. The construction of loop plant involves various direct material, equipment, and labor costs, such indirect expenses as sales taxes, shipping charges, and other expenses as well. Feeder plant costs are calculated on a per foot basis. Distribution costs are calculated on a "capacity unit" cost basis, "based on the service design criteria (or model) for an average loop. . . ." The unit of capacity is the loop. The capacity unit cost is the dollar cost of the expense divided by the number of loops to which the expense applies. [7]

11. Investments in distribution plant are modeled separately from investments in feeder plant. RLCAP employs five density groups. They range from a design intended to represent very densely populated urban settings with high concentrations of residential and business customers (DG1) to a design intended to represent very sparsely populated rural settings with few customers (DG5). These five designs are used to represent all the distribution areas in U S WEST's 14-state service territory.

12. Once total costs for each density group are estimated, the sum is divided by the assumed number of working lines in each group to determine average cost per line by density group. [8] The result is that each density group provides a single average cost for a working line and the model generates five average costs. These average costs are identical for every line in the same density group in every state in U S WEST's territory, except for small differences based solely on differences between the states in their mix of residential and business lines.

13. The universe of wire centers is modeled as consisting of four different groups. Each of the four wire center groups is defined by a single variable: the number of working subscriber pairs. The very small wire center group consists of wire centers with fewer than 2,501 working pairs; the small group encompasses wire centers with 2,501 to 10,000 working pairs; the medium group range is 10,001 to 30,000 working pairs; and the large group range represents all wire centers with over 30,000 working pairs.

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[7] *Id.* at 1.2.
[8] Tr. Vol. 4 at 217-18.

14. For each type of service and wire center group, RLCAP contains a loop length file. These files provide the percentages of loops of a given length in 1000 foot increments. [9] For example, three percent of all the loops in medium wire center groups may be between seven and eight kilofeet in length; five percent between eight and nine kilofeet; and four percent between nine and ten kilofeet. If five percent of all residential loops in medium wire centers are between eight and nine kilofeet in length, then the probability that any given residential loop in a medium wire center is between eight and nine kilofeet in length is .05.

15. In addition to the feeder length frequency files, RLCAP contains files that relate feeder lengths by wire center group to density group occurrences. [10] These files are based on the assumption that, for each wire center group, the probability that a distribution area corresponds to one of the five density group varies with the length of the feeder. The basic assumption is that the more dense distribution groups are less likely to occur, and the less dense groups are more likely to occur, as distance from the wire center increases. Across wire center groups, the more dense distribution designs occur more frequently as the wire center size increases and conversely with respect to the less dense distribution designs.

RLCAP's Weaknesses

Use of Embedded Data

16. The U S WEST models are basically "revamped" versions of their generic service cost models which they use to file for tariff rates for services like Touch Tone or Centrex. [11] They were updated in an attempt to comply with TELRIC requirements, but all the U S WEST models, and RLCAP in particular, heavily rely on embedded costs and structures and assumptions based on old data.

17. RLCAP is not well integrated with the other U S WEST models. Changes in one model's results due to alterations in input values or algorithms are not automatically captured in the other models. The fact that U S WEST's models are not tightly coupled allows for inconsistencies to develop across models, such as different line counts in RLCAP and SCM. [12]

Unsupported Key Data

18. U S WEST has provided little support for the five distribution designs used in RLCAP. The same five designs are used in all fourteen of U S WEST's states. U S WEST has not offered any evidence that these designs do in fact correspond to actual distribution areas, much less that the five designs adequately represent all distribution areas in Minnesota. The designs might be the result of least-cost, forward-looking criteria, but they might not be.

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[9] *Id.*
[10] *Id.* at 1.7-1.8.
[11] Ex. 604 at 9.
[12] Ex. 603 at 10; Tr. Vol. 8B at 61-62.

19. RLCAP does not actually model any distribution areas or compute costs based on information about the distribution areas in which actual customer locations are found. RLCAP neither provides nor uses any information about distribution area boundaries or distribution area living units.

20. RLCAP does not attempt to model either actual or forward-looking distribution lengths in the “scorched node” context required for a TELRIC analysis. The model uses wire center group level feeder length files to measure the distances from the wire center to the serving areas interface (SAI). However, customers are actually located at various distances from SAIs. RLCAP's approach assumes that distribution lengths have the same fixed relationship to feeder lengths in every wire center in each wire center group. [13] Again, U S WEST provides no support for this assumption.

21. U S WEST obtained loop length data from several sources. Of the various potential data sources mentioned, the documentation does not reveal which sources were actually used. [14] Nor is there any discussion of how loop length information was actually estimated for inclusion in any of the sources of such data. The documentation does not indicate whether the loop length information is Minnesota specific, whether it is comprehensive or sampled information, nor how dated the information is.

22. According to U S WEST's response to DPS IR 0167, the Minnesota mechanized loop census was conducted in 1989. [15] In its reply to OAG information request 121, U S WEST stated that "[t]he only wire center loop length files available for Minnesota are the files currently in the RLCAP model. This data was collected in 1988." [16] U S WEST witness Mr. Buckley could not state whether all loops in Minnesota were equally likely to be represented in RLCAP data. He testified that "my gut feeling is that there probably is far better data in the higher populated or the more greatly populated wire centers, than where the data may be a little thin as in the low density areas." [17]

23. Department witness Mr. Legursky thought it likely that the data for the very large wire center group would be particularly inaccurate because "the data which does exist for the half of the loops in the large [wire center group] is skewed to newer feeder and distribution areas because the record data was entered into LFACS, LMOS and LEIS coincident with job completion." [18] Mr. Legursky further stated that "[t]he Mechanized Loop Census must be accepted; it cannot be verified. It is old and outdated. Yet, it is the key piece of data used in RLCAP." [19]

24. For each wire center group, there is a single profile of its density group composition. [20] There is, however, no support for this assumption. Nor is there any reason

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[13] Ex. 503A at 13.
[14] Ex. 264 at 1.5.
[15] Ex. 604, JWL-4 at 9.
[16] Ex. 503B, GMM-1 at 39.
[17] Tr. Vol. 4 at 223.
[18] Ex. 603 at 23.
[19] Ex. 603 at 55.
[20] Ex. 603 at 25-26.

to believe that the density group profiles of wire centers should be the same across U S WEST's fourteen state region. For example, a medium size wire center in sparsely populated Wyoming might consist of higher proportions of the least dense density groups than a medium size wire center in more densely populated Minnesota.

25. U S WEST has offered no support for the values it has given to the occurrences of density groups at different feeder lengths across wire center groups. [21] The kilofiles in RLCAP, like the distribution designs, are the same across U S WEST's 14-state region. [22] U S WEST has provided no evidence that Minnesota's actual density characteristics match the kilofile representations.

No Estimates of the Cost of Serving Particular Areas

26. A critical failing of RLCAP with respect to determining UNE costs is that it does not attempt to estimate costs for specific distribution areas. [23] Whereas HAI constructs clusters based on actual locations of customers in Minnesota and then develops distribution costs based on the location of the cluster and its distance from the wire center, RLCAP uses no information about Minnesota customer locations or distribution areas. As previously noted, one set of dated and incomplete information provides RLCAP with information about feeder length occurrences by wire center group. Another set of files provides information about distribution group occurrences by distance intervals from the wire center. These data are unsupported. Both sets of data generate cost estimates at a very high level of aggregation, too high a level to be useful in geographically deaveraging costs. [24]

27. RLCAP is capable of "deaveraging" costs only to the wire center group level. The four wire center groups in RLCAP are associated with four average costs per line. The number of lines in a wire center determines the average cost of a loop in that wire center. [25] The model does not generate Minnesota-specific cost estimates and should not be used as the basis for Minnesota UNE prices. RLCAP simply produces a single average loop cost for each of its four wire center groups.

28. Using RLCAP, each one of U S WEST's fourteen states will have costs that consist of various mixes of these four average loop costs, depending on the mix of wire center groups in each state and to a very minor extent, differences in the residential/business mix across states. The cost of a loop in a medium size wire center is the same regardless of whether that wire center is located in a rural, a suburban, or an urban area; or whether the soil is loamy or solid rock. [26] A related problem is that structure costs are not modeled based on actual soil or terrain characteristics of particular areas. The structure costs

[21] Ex. 350 at 441.
[22] Ex. 503A at 12.
[23] Ex. 603 at 18.
[24] Ex. 603 at 55.
[25] Ex. 503A at 16.
[26] Ex. 350 at 449-50; Tr. Vol. 4 at 242-43.

associated with a density group design in RLCAP are invariant with respect to location. A density group design is associated with certain fixed structure costs. [27]

29. U S WEST claims that "RLCAP calculates the investments for loop and drop wire by applying investments …to loop lengths" (emphasis added). [28] That statement mischaracterizes what RLCAP does. As explained above, RLCAP does not use data on the complete loop length. Instead, those cost estimates are based on feeder lengths, and assumed distribution costs at different feeder lengths. This is a very important distinction in that feeder is a relatively small cost of the whole loop. The majority of the loop cost is the cost for the distribution plant which RLCAP assumes is always the same in all states, save for differences in state-specific input costs. [29]

30. Further, the kilofiles, which show the probability of each density group at various feeder distances from the wire center are the same in all of U S WEST's states. [30] All that varies across the states are the average lengths of feeder in each wire center group, the number of wire centers in each wire center group, and the weighting of the residential and business kilofiles.

31. RLCAP makes no use of geocoded data to locate customers. Nor do RLCAP's distribution area designs rely on census data. [31] The distribution designs were developed by several U S WEST engineers in 1988. [32] U S WEST has not provided any other support for these designs. The identical designs are used in each state in U S WEST's 14-state region. Both Department witness Mr. Legursky and OAG witness Mr. Morrisette testified that they were unable to determine from the information U S WEST provided whether the distribution designs were either reasonable or representative of Minnesota serving areas. [33]

32. These defects of RLCAP are structural. U S WEST has admitted that modifying the model to accommodate the measurement of costs for a specific wire center would involve a major redesign effort.[34]

Inconsistent with TELRIC Principles

33. Correct estimates of costs should have the numerator (the total increment of costs required to provide the element of concern) consistent with the denominator (the demand for the element to be provided with those facilities). U S WEST does not have a proper match of the numerator and denominator. As proposed by U S WEST, RLCAP 4.0 determines costs by placing enough distribution facilities to serve ultimate future demand but divides those costs by the current level of demand. In effect, this approach has today's ratepayers and competitors paying for loops used to provide service to future customers

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[27] Tr. Vol. 4 at 279.
[28] See Ex. 122 at 1.
[29] Ex. 349 at 11-12.
[30] Tr. Vol. 4 at 292-93.
[31] Ex. 503A at 8.
[32] Ex. 503B, OAG IR 113 and 122, GMM-1 at 19, 40.
[33] Ex. 503A at 9-10; Ex. 603 at 18, 23.
[34] Ex. 604, JWL-4 at 22.

and competitors. With this mismatch, as the demand increases in the future, U S WEST would collect more revenue than the costs to provide the distribution facilities.[35]

34. DG5 is the distribution model U S WEST uses to compute the cost of loops used to serve farms, homes and business in rural areas (rural customers). With similar cable costs, the modification of DG5 from the previous version of RLCAP 3.5, RLCAP 4.0 increases loop costs computed for rural areas by more than 35%. Confidential Exhibit TMZ-3, Ex. 350 provides a comparison of the facilities and assumed number of customers served by DG5 in RLCAP 3.5 and RLCAP 4.0. In both versions of RLCAP, U S WEST assumed the exact same types and lengths of cables; thus, DG5 is assumed to provide service to the same size geographic area and has the same total costs for those facilities. But, in RLCAP 4.0, U S WEST assumed DG-5 will have fewer service drops and thus provides service to fewer customers.

35. This change in assumption increases costs substantially. DG5 has the same amount of cable in both versions 3.5 and 4.0. The sum of the costs of 50 pair buried cable, 25 pair buried cable, 25 pair aerial cable, 100 pair stub cable represent approximately 90% to 95% of the total distribution costs in DG5. When the number of rural customers assumed in RLCAP 3.5 is replaced with the assumed number of customers in RLCAP 4.0, the cost per loop for cable and cross connects increases by 40%. Assuming that the cost for the facilities did not change, then, the total cost per loop in rural areas would be approximately 35% higher than U S WEST computed with the assumption in RLCAP 3.5. By changing the "rural customer" assumption, RLCAP version 4.0 produces an increase in the investment cost of a rural loop of more than $750. [36]

36. The density group design approach artificially limits the economies of scale potentially achievable in a scorched node environment. For example, the largest size cable placed in any of RLCAP's density groups is 900 pair. [37] In contrast, HAI will place larger cables in distribution areas to capture economies of scale. Distribution plant design should permit the deployment of any equipment that is available provided that such equipment is least-cost and embodies forward-looking technology.

37. With regard to structure sharing, RLCAP assumes that developers will pay 20% of the costs of placing buried cable facilities in distribution areas and that when developers do not pay such costs, it will incur 100% of such placement costs. With respect to aerial cable, it has assumed that some entity other than U S WEST will pay half of the cost.

49. U S WEST assumed it could achieve more sharing in dockets in other states. For example in Oregon, U S WEST signed a Stipulation with OPUC Staff in which it agreed that it was reasonable to assume developers would pay 35% of the placement costs for buried cables and some entity other than U S WEST would pay 50% of pole costs. If it is reasonable to make those assumptions in Oregon, it should be assumed that U S WEST pays no more than 65% of buried placement costs and no more than 50% of pole costs in Minnesota.

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[35] Ex. 349 at 16-17.
[36] Ex. 349 at 12-13.
[37] Ex. 350 at 445-46.

38. In actuality, RLCAP does not compute either actual or forward-looking structure costs. Instead, RLCAP simply applies an average cost. Pole investment, for example, is calculated by multiplying the length of cable involved by the ratio of pole investment to aerial cable investment. [38] As Mr. Buckley explained, "what we do is develop the investment for the cable itself and then apply that ratio to develop the structure for it, the conduit system or the poles." [39]Thus, if a more expensive cable is installed, the associated structure cost rises in equal proportion. [40] The problem is that it is not evident that structure costs should increase in such situations. For example, there is no reason to suppose that a pole carrying a 200 pair cable should cost twice as much as a pole carrying a 100 pair cable. This modeling method is not sufficiently specific and, therefore, is not consistent with TELRIC principles.

39. Another example of the unreasonable rigidity deriving from RLCAP's methodology is the treatment of digital loop carrier (DLC). DLC is network transmission equipment that provides a pair gain function. "Pair gain" refers to the multiplexing of telephone conversations over a fewer number of physical facilities. DLC is available for both fiber and copper facilities. RLCAP deploys only a single type of fiber DLC system in the small, medium, and large wire center groups. In the very small wire center group, RLCAP uses a weighted average of DLC costs from two different vendors. [41] A TELRIC approach to modeling DLC would involve determining which configuration is least cost in each particular situation.

40. DPS witness Mr. Legursky's analysis of the sensitivity of RLCAP cost estimates to changes in its fill factors revealed that costs increased inexplicably as fill rose from 80% to 90%, and that, generally, as fill rose costs decreased much less than he expected. [42] Mr. Buckley admitted an error in RLCAP's calculation mechanism was responsible for the unexpected jump in costs at the 90% fill level. [43] However, Mr. Legursky's observation that costs should have decreased more than 3.51% as fill rose from 50% to 99% remains. [44]

41. Another problem with the RLCAP methodology is that it applies the same fill factor to both copper and fiber technology. Fiber DLC systems have higher fills because they can be installed in smaller increments of capacity than copper cables. [45] These failings too illustrate that RLCAP is not consistent with TELRIC principles.

42. Mr. Legursky also pointed out that RLCAP employs a longer planning period than U S WEST engineers use in actuality, five versus three years. RLCAP generates plant sufficient to meet growth over the next five years. According to Mr. Legursky, it "is unreasonable to assume a longer planning period for cost modeling purposes than what is

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[38] Ex. 603 at 16.
[39] Tr. Vol. 4 at 252.
[40] Tr. Vol. 4 at 252.
[41] Ex. 603 at 17.
[42] Ex. 603 at 27.
[43] Tr. Vol. 4 at 246-47.
[44] Ex. 603 at 27.
[45] Ex. 603 at 30.

actually used in reality."[46] Because RLCAP assumes a growth rate of loops "in excess of 4 percent" per year, the longer planning period increases the number of loops modeled by at least 8.16%.[47] The result is that RLCAP builds too much plant. A forward-looking network design would not be based on a planning period longer than that which is actually used.

43. U S WEST's witness Mr. Buckley states that comparison of RLCAP results to 1995 and 1996 U S WEST construction costs "provides evidence that U S WEST's cost studies produce reasonable, if not conservative, estimates of the cost of providing telecommunications services."[48] There is no reason to believe that U S WEST's actual construction costs are relevant. Mr. Buckley provides only two data points, 1995 and 1996 data, and they vary substantially in the per line cost. Further, Mr. Buckley provides no reason to suppose that U S WEST's actual construction costs involved representative loops that were constructed in least-cost fashion using forward looking technologies. OAG witness Morrisette testified these charges could not be fairly compared to RLCAP's estimated costs because there they were not properly adjusted to correct for the double counting of spare capacity and because they were not representative of all of U S WEST's loops.[49]

44. The centerpiece of RLCAP is its use of embedded lengths as a principal driver. Mr. Buckley defends the use of embedded loop length data in RLCAP by stating that:

> [t]he TELRIC scorched node parameters state that wire centers will be assumed to be where they are today. Customers and roadways will also remain where they are. Based on that alone, actual measured feeder lengths are the best representation of TELRIC feeder routes. HAI uses a geometric approach to approximate feeder lengths. This may be a reasonable surrogate, but it is not better than actual data.[50]

There are a number of fallacies in U S WEST's argument. First, customer locations do change. U S WEST's telephone plant was constructed incrementally as growth occurred and as customer locations shifted. Thus, the telephone plant is not optimally designed. Second, technological developments change the characteristics of least-cost plant design over time.[51] A necessary consequence of technological development is that past embedded technologies and the network designs based on those technologies become outmoded. Third, RLCAP's uses feeder lengths from a dated and incomplete study whose results cannot be practically validated.[52] Since actual feeder lengths themselves are at best a surrogate for the lengths of feeder cables in a least-cost, forward looking network, RLCAP's kilofiles involve two layers of approximations.

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[46] Ex. 603 at 30.
[47] Ex. 604, JWL-4 at 12.
[48] Ex. 121 at 4.
[49] Ex. 503A at 34.
[50] Ex. 124 at 16.
[51] Tr. Vol. 4 at 263-66; Ex. 629.
[52] Ex. 603 at 23.

45. Finally, and again, RLCAP does not use any actual distribution length data, it extrapolates from the feeder data. As Mr. Morrisette states, "[i]n essence, the model assumes that customers are distributed within a distribution area in exactly the same way SAIs are distributed within wire center groups. However, there is no support for the assumption that a distribution pattern exists between customers in a serving area and SAIs in a wire center group."[53] In summary, even if it were true that actual loop length data should be used in a TELRIC study, RLCAP would not comply because it only has partial data on a part of the loop.

46. The ALJ concludes that RLCAP does not qualify for serious consideration in this proceeding. It has not been shown to produce reliable, reasonable results. It cannot be used to calculate geographically deaveraged rates in a meaningful way. None of its major defects can be remedied easily. RLCAP is an unacceptable model for the purpose of determining UNE costs for U S WEST in Minnesota.

THE HAI MODEL

47. The HAI model is the only acceptable model offered in this proceeding for estimating the costs of UNEs. The only serious questions raised about HAI relate to its customer location and outside plant design methodologies. The Commission is familiar with the model from previous proceedings, so it will not be discussed in detail except to address significant issues and necessary adjustments.

Customer Location

48. HAI's preprocessing is performed at PNR. To the extent possible, it uses address data to create geocoded locations of customers within census blocks (CBs). HAI has geocoded location information for over seventy percent of Minnesota telephone subscribers.[54] The remaining customer locations for which no addresses are available must be estimated by a surrogate location methodology. (Other sources of geocoded customer information will become available over time. For example, utility companies can be expected to start accumulating geocoded information on customer locations.)

49. HAI assumes that non-geocoded customers are located an equal distance from each other on the exterior boundary of the census block.[55] This method produces the maximum distance between non-geocoded customers within each CB, but may create false clustering along shared boundaries. It has an element of reality in that CBs are often bounded by roads and customers are located along roads. The Census Bureau generally locates census block boundaries along populated roads to produce well-defined population areas.[56]

50. The BCPM produces surrogate locations (actually, all of its locations) by placing customers along roadways, excluding roadway types that are unlikely to have population

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[53] Ex. 500 at 13.
[54] Ex. 634 at 953.
[55] Ex. 315 at 30.
[56] Tr. Vol. 9 at 129; Ex. 315 at 30.

along them. In the Fifth Report and Order, the FCC found HAI's use of geocoded customer locations preferable, but also found that a roadway methodology similar to the BCPM's would be better at placing non-geocoded customers than HAI's CB-border methodology.[57]

51. MCI and AT&T have indicated to the FCC and in this proceeding that its preprocessing routines can be modified to use a roadway methodology for surrogate placement. Based upon Mr. Legursky's description of the accuracy of the preprocessing module and Mr. Denney's testimony, it appears unlikely that such a modification would produce a significant change in loop costs.

52. Once all customer locations are established by either geocoded data or by the surrogate location methodology, the preprocessing module groups customers into clusters. The only restriction on the location of clusters is that they cannot cross a wire center boundary. They can, however, cross census block boundaries.[58]

53. The clustering algorithm groups customers together within certain constraints. No customer location may be more than 18,000 feet from the cluster's centroid, clusters may not contain more than 1800 lines, and no customer location may be more than two miles from its nearest neighbor in the cluster. *Id.* To efficiently perform clustering calculations, all customer locations are assumed to be at the center of 150 square foot cells. The clustering algorithm takes a cell and searches for neighboring cells containing customer locations. If a neighboring cell is populated, the algorithm determines whether any of the cluster constraints would be violated by adding the cell to the cluster. If not, the cell is added to the cluster and the search process is repeated. Once this process is completed, the algorithm runs again, but checks for populated neighboring cells within a two-cell distance from the initial cell. The algorithm continues to run, enlarging its search range each time, until no more cells can be added to the cluster without violating one of the constraints. *Id.* at 32.

54. The next step in the preprocessing involves chaining outlier clusters (those with four or fewer customers) to main clusters (those with more than four customers) so as to minimize the length of the chains. In addition, the algorithm rectangularizes each cluster about its centroid so that it has the same area and centroid as the convex hull of the cluster. *Id.* at 33. In designing distribution plant, the HAI assumes that the number of customers identified for each cluster are uniformly distributed throughout each cluster.

55. The FCC agrees that a clustering process must be used, but chose the clustering methodology proposed by its staff in the HCPM. It uses a technique of dividing up the wire center customers into clusters rather than building clusters of nearby customers. The FCC found that the HCPM methodology creates the least-cost groupings.[59]

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[57] Fifth Report and Order ¶¶ 26, 31-41.
[58] Ex. 315 at 31.
[59] Fifth Report and Order, ¶¶ 47-53.

Distribution Plant

56. The PNR cluster data is used by the HAI Model to design distribution and feeder plant. The actual and surrogate locations of the customers used to create the clusters is not passed to HAI, only the size and location of rectangularized representations of the clusters and the number of customers in each location. For each cluster in each wire center, HAI designs feeder plant from each wire center to the center of every cluster in the wire center and distribution plant from the center of each cluster to almost the edges of the cluster. It does this by dividing the total area of the cluster by the number of customers to determine the average area occupied by each resident, which it inaccurately calls an average "lot," then determines the average lot width and lot depth by applying a 2:1 ratio. The module then calculates the length of "backbone" distribution cables from the center point to the top and bottom edges of the cluster, minus the average lot depth. It next calculates the number of branches needed by dividing the height of the cluster by the average lot depth. Finally, it calculates the length of "branch" distribution cables from the backbone to the side of the cluster, less the average lot width. The distribution plant is the total length of the two backbone cables and the branches. The module then sizes and costs the required cable and equipment.[60] The process may be visualized as dividing each cluster into "lots" and then designing distribution along north-south and east-west lines to the nearest corners of the lots in the corners of the cluster, and then adding enough east-west branches to reach an inner corner of every other "lot" along the sides of the cluster. Thus, there is a branch reaching or passing by every "lot" in the cluster. The loops are completed by adding in the cost of the drops for every lot in the cluster and other required equipment and materials.

57. In some clusters, HAI produces too little distribution plant. One factor that may lead to underestimating is that in low density clusters, the calculated average "lot" size is far larger than a typical lot, so the branches and drops won't reach the customers. In other cases, HAI produces too distribution plant. A factor that may lead to overestimating is that spreading customers evenly throughout the cluster means that the HAI designs distribution to cover every square inch of every cluster when, in fact, there is always subclustering of customers that makes that unnecessary. Another is that rectilinear design does not take advantage of opportunities to use shorter, more direct routes.

PNR Issues

58. U S West introduced several *ex parte* filings Sprint made with the FCC raising the issue of whether the HAI model estimated sufficient distribution plant to serve telephone subscribers in Nevada, particularly in the low density areas of the state.[61] The ALJ then issued orders permitting U S West and the Department to obtain certain customer location data from PNR to investigate whether Sprint's allegations applied to the HAI model's estimation of costs in Minnesota. Following preliminary analysis by U S WEST and the Department on the information obtained from PNR, the ALJ permitted the parties to file

[60] Ex. 315 (HAI Model Description), App. E.
[61] Ex. 292-93.

supplemental direct testimony and replies and further ordered a workshop session to explore the matter.

59. The information US WEST obtained during the visit to PNR included the minimum spanning tree (MST) distances connecting customer locations for each HAI cluster in Minnesota, the length of the diagonal of the minimum bounding rectangle for each cluster, and information identifying each cluster and its associated wire center.[62]

60. The MST distances were computed by a program developed by Stopwatch Maps. The MST is not the absolute minimum length of lines necessary to connect all customer locations within a cluster. It is actually a gauge of dispersion and is close to the minimum length of the lines necessary to connect all locations within an area without using additional connecting points. Because wireline telephone service must connect each customer to the telephone network, the MST distances could be a measure of the adequacy of the telephone cable lengths generated by the cost proxy models submitted in the case. However, the MST has never been used in that manner by telephone network engineers. Nevertheless, the FCC has chosen to use an MST technique as an optional method of designing distribution in its Universal Service platform.[63]

61. U S WEST expert witnesses Dr. Emmerson and Dr. Duffy-Deno testified that their study of the PNR data and MST distances revealed two "flaws" in the HAI model. The first involves "[t]he conversion of PNR's irregular polygons into equivalent area rectangles [that] effectively compresses the size of the serving area so that HAI 5.0a underestimates the required amount of distribution distance." (Emphasis in original).[64] The second has to do with the division of the equivalent area rectangle into rectangular lots that are served with branch and backbone cable that does not extend to the rectangle's boundary but instead stops one lot's distance from the boundary. *Id.* For low density clusters, this second "flaw" results in telephone facilities being concentrated in the centers of the equivalent area rectangles.

62. Both of these criticisms of HAI distribution plant design methodology were based on information previously available to U S WEST or on information previously obtainable by U S WEST. Nothing of substance was gained at PNR by the US WEST witnesses.

63. The process of locating the vertices of the irregular polygons that are then converted into equivalent area rectangles, is discussed in the HAI documentation.[65] U S WEST could have requested more information about this process at any time.

64. The second "flaw" U S WEST "discovered" as a result of its visit to PNR was that the HAI model does not deploy distribution cable that touches the boundary of the equivalent area rectangle but instead stops one lot width from the boundary. This is exactly what the HAI documentation says the model does.[66] When U S WEST witness

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[62] Ex. 815 at 8.
[63] Fifth Report and Order, ¶33.
[64] Ex. 815 at 5.
[65] Ex. 315 at 33.
[66] Ex. 315 at 42.

Mr. Copeland criticized the HAI model for deploying too little distribution plant in his March 23, 1998, prefiled testimony and his April 23, 1998, live testimony, he revealed a full understanding of that aspect of the model.[67] Neither U S WEST nor the Department learned anything new from their visit to PNR about how equivalent area rectangles were developed for use in the HAI model.

65. The additional evidence U S WEST produced could have been produced earlier had the company acted with reasonable diligence to obtain it. U S WEST claims the visit to PNR was necessary "to review the PNR clustering information."[68] However, U S WEST did not produce any new information about the clustering process as a result of its visit. U S WEST only made measurements they could have made previously had they asked to do so. Dr. Fitzsimmons' testimony on special access, in so far as it went beyond discussing the methodology for implementing Mr. Legursky's recommendation for counting special access lines differently in the feeder plant than the distribution plant, was also not new evidence. None of the evidence offered by U S WEST changed its advocacy before the ALJ and the Company made no new recommendations as a result of the evidence.

66. It was the occurrence of long, narrow, diagonal clusters in Nevada that caused the alleged HAI clustering distortions of which Sprint complained to the FCC and that formed the basis for U S WEST's request and the Administrative Law Judge's order allowing the parties to visit PNR to check for similar problems here. But, as Dr. Emmerson testified, the U S WEST experts found no "Nevada-type" clusters in Minnesota. What he found was that there was some difference in the dispersion between the PNR locations and the HAI cluster-assumed locations.[69] But, as Mr. Legursky testified, the additional evidence produce by the PNR visit is not "new" and certainly does nothing to discredit the HAI clustering and distribution design methodologies. On the contrary, the evidence from PNR and other evidence presented at the workshop following the PNR visit lend even further support to the conclusion that those methodologies are reasonably accurate and meet all relevant requirements. Mr. Legursky noted the apparent accuracy of the PNR methodologies. As discussed next, MCI and AT&T witnesses showed that HAI designs more than sufficient distribution when measured against any reasonable standard.

67. Because the evidence presented from the PNR visit weighs in favor of the HAI proponents, the ALJ finds no reason to exclude it in this proceeding. However, the ALJ recommends that the Commission deny US WEST's request for reconsideration in the Universal Service proceeding because there is no new evidence supporting US WEST's position on these issues.

68. US WEST argues that in all main clusters where the HAI model's distribution plus drop lengths fall below minimum spanning tree distances, the distribution cable plus drop lengths should be adjusted upward to at least equal the minimum spanning tree distances. They estimate that the incremental increase to the HAI estimate of the average monthly unbundled loop cost for U S WEST's entire serving area in Minnesota that would by

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[67] Ex. 168 at 2-6; Tr. Vol. 4, at 161-165.
[68] Tr. ,Workshop, at 61.
[69] Tr., Workshop, at 63-64.

caused by changing the distribution lengths to equal the minimum spanning trees would result in a $.79 upward adjustment to the cost of the unbundled loop generated by the HAI model, using the DPS proposed adjustments.[70]

69. Alternatively, and in response to questions raised by the ALJ at the July 22, 1998 workshop, U S WEST proposed modifying the HAI model so that the distribution area lot depth is set at a maximum of two times the drop lengths used by the HAI model to place distribution facilities.[71] In Dr. Fitzsimmons' view, such an adjustment would correct the HAI model's unrealistic compression of distribution facilities on the interior of the serving area rectangle and will result in the branch and distribution cable being placed closer to the outside boundary of rectangular serving area created by the HAI model.[72] In other words, branch and backbone cable would be moved out closer to the locations where the HAI model assumes the customers are located. As a result of this adjustment, in each of the HAI density zones, the maximum distance from the termination of the branch and backbone cable to the perimeter of the serving area rectangle would be significantly reduced. Dr. Fitzsimmons has quantified the dollar value of this modification to be $1.15.[73]

70. ATT and MCI witnesses Mr. Denney and Mr. Pitkin demonstrated that, in fact, the HAI Model appropriately estimates the necessary cable to serve customers. Mr. Denney pointed out that the HAI Model estimates longer average loop lengths than both the BCPM and RLCAP. The HAI Model estimates a longer loop length for U S WEST as a whole and for the majority of density zones, including the first two density zones where U S WEST claims HAI's estimates are poor.[74] BCPM's distribution cable lengths tend to be shorter than those estimated in the HAI Model, and its feeder lengths tends to be longer. The best comparison between the two models is average total loop length. A comparison of these numbers shows that HAI models a longer loop length than does BCPM.[75]

71. Mr. Denney also compared the average loop lengths of RLCAP with those of HAI. RLCAP summarizes loop lengths by office size (very small, small, medium and large) and reports shorter average loop lengths than HAI for every office type. According to US WEST, RLCAP cost estimates are based on a sample of actual loop lengths.[76]

72. In adopting its Universal Service platform, the FCC decided that its model should make the best use of the customer location information by designing outside plant to those locations, rather than to evenly dispersed locations in each cluster. In its analysis, the FCC found that HAI, and BCPM to some extent, were likely to underestimate distribution in low density areas. It chose to use the HCPM methodology, which designs outside plant to

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[70] Ex. 816 at 8.
[71] Tr., Workshop, at 152-53.
[72] Tr., Workshop, at 152-53 and 186-191.
[73] *Id.* at 154.
[74] Ex. 381 at 4-8.
[75] Ex. 381 at 6.
[76] Ex. 381 at 7.

within a few hundred feet of every actual or surrogate customer location.[77] Until the HCPM was proposed, no model had the ability to do such detailed design.

73. The ALJ concludes that the evidence in this record demonstrates that the HAI designs adequate outside plant and makes a reasonably accurate determination of loop costs on a wire center basis. The fact that some clusters may be low and some high provides additional argument that deaveraging below the wire center level should not be attempted. It does not mean that there should be one-sided adjustments to bring the low clusters up as U S WEST proposes. Therefore, the ALJ does not recommend either of U S WEST's proposed fixes. The Commission may wish to track the development of the FCC's distribution design methodology for future modifications of the Minnesota model, but it is necessary to proceed now with the available models to establish prices for UNEs so that competition can proceed.

Other Outside Plant Issues

74. The outside plant of a telephone network consists of the feeder cables that run from the wire center to a serving area interface, the distribution cables that run from the serving area interface to the block terminals or pedestals, and the drops that run from the block terminals to the network interface device, which in turn connects to the customer's inside wiring. These various cables may be buried, placed underground in conduit, or hung in the air from poles. The structure built for telephone plant may be shared with others. The set of percentages of the cabling (or fiber) that is buried, underground, or aerial is called the plant mix. The cost of placing facilities in the ground varies with ground conditions. Ground conditions vary according to the natural soil type, e.g., rocky or sandy, as well as with the structures people have placed upon or set into the ground, i.e., placing a cable under a road requires the road surface either be cut or bored under. Under certain ground conditions, aerial placement may be required.

75. In the FNPRM[78], the FCC provisionally concluded that the selected universal service model should permit both terrain factors and line density zones to factor into the determination of plant mix. Further, the FCC considered that relatively more feeder and distribution cable should be assigned to aerial installation for all population density groups in wire centers characterized by "hard rock" conditions that those in wire centers with other terrain conditions.[79] In addition, the FCC indicated its preference for a model that should similarly specify costs for installation of aerial cable, buried cable, and underground cable that incorporate terrain factors and line density zones.[80] The FCC also tentatively concluded that the selected model should specify costs per foot for conduit installation that vary by line density zone, that materials and installation costs should be separately identified by both density zone and terrain type, and that the model should define density zones based on the number of telephone lines per square mile.[81] Finally, the FCC

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[77] Fifth Report and Order, ¶¶55-60.
[78] Further Notice of Proposed Rulemaking, CC Docket Nos. 96-45 and 97-160, July 18, 1997.
[79] FNPRM, ¶ 58.
[80] FNPRM, ¶ 65.
[81] FNPRM, ¶ 67.

tentatively concluded that the selected model should prescribe additional costs to account for additional expenses caused by difficult terrain.[82] The FCC indicated that a satisfactory model for estimating universal service costs would permit plant mix and installation costs to vary by ground conditions, whether of natural or human origin.

76. Because they encourage accuracy, these criteria for universal service cost proxy models are appropriate as well for cost models for UNEs, especially if the model will ever be required to compute geographically deaveraged costs. HAI's cost methodology fully comports with the FCC's recommendations.[83] HAI considers bedrock depth, rock hardness, surface soil type, and water depth in calculating placement costs. HAI assumes each serving area has the geological characteristics of the census block group into which it predominantly falls.[84] HAI permits installation costs to vary by density zone as well.[85]

77. U S WEST criticizes the HAI's maximum loop length assumption. U S WEST witness Mr. Schaaf claims that the maximum loop length should be limited to 12,000 feet and not extend to 18,000 feet as assumed in the HAI Model.

78. When DLC equipment is used, it adds resistance to the loop, which shortens the maximum loop length. With extended range cards, DLC will function with 26 gauge copper cables of up to 17,960 feet and with 24 gauge cables of up to 28,900 feet. The HAI model relies on extended range cards to deploy DLC equipment with 26 gauge copper loops of 18,000 feet.

79. The HAI model does not explicitly identify the loops that require extended range cards. Instead the HAI uses a card cost that represents a composite cost of a POTS card and an extended range card. As a general rule, the relative percentage of loops of a given length declines as length increases. With respect to long loops, it is therefore conservative to model loop occurrence as a constant across all distances up to the maximum 18,000 foot deployment of copper loop beyond the DLC permitted by the HAI model. Under this assumption, the percentage of loops that would require extended range cards is 12%. A standard card costs approximately $270. An extended range RUGV2 card costs 25% more or $337.50. HAI uses a composite card cost of $310.[86] If 12% of all loops required the RUGV2 card and the remaining 88% could use the POTS card, the average cost of necessary cards would be .12 x $337.50 + .88 x $270.00 = $40.50 + $237.6 = $278.10, well below the HAI composite card cost.

80. The FCC has concluded that its platform should assume a maximum copper loop length of 18,000 feet because length will support the required services at appropriate quality levels.[87] The ALJ concludes the HAI model adequately estimates costs for long loops and that copper loops of up to 18,000 feet are acceptable.

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[82] FNPRM, ¶¶ 36, 66.
[83] Ex. 315 at 34.
[84] *Id.* at 39.
[85] Ex. 334 at 1029-30.
[86] Tr. Vol. 8A at 109.
[87] Fifth Report and Order, ¶¶68-70.

Switching

81. U S WEST uses the SCM model for switching in its cost models, including the BCPM. The SCM model determines how much of various switch resources are consumed in the different switch functions of processing, terminating lines, switching lines, and handling trunks. These resources are assigned costs. Various switch services and features are then costed on the basis of their use of the different switch resources.[88]

82. The SCM input processes are highly complex and extremely sensitive to U S WEST's designated inputs, which are unknown, undocumented and proprietary. In addition, there are numerous SCM inputs that require decisions regarding the type of technology and efficient engineering practices that cannot be discerned from any of the documentation or models provided.[89]

83. Despite the complexity of SCM, the model deploys the same switches from the same manufacturer as are currently in place, unless the current switch is an analog switch, in which case SCM deploys a digital switch.[90] Contrary to TELRIC principles, SCM does not consider whether switch from another vendor might be more cost effective than the switch currently used at each location.[91]

84. The HAI model uses a declining logarithmic cost curve based on the cost per line of a switch.[92] The curve is a regression curve based on four observations of switch costs.[93] The HAI uses publicly-available information for switching prices and does not rely on proprietary data. HAI's inputs for developing switching costs may be entered directly out of contract information on prices paid by ILECs for switches, if such data is available.[94]

85. Switch deployment for the purpose of UNE costs should not only involve forward-looking technology, it should also require that the forward-looking technology be least cost. But, as Mr. Legursky observed, "SCM does not universally deploy the least cost equipment."[95] That is because optimal network configuration has changed over time.[96] It cannot by concluded that deploying the same digital switch from the same vendor as is currently deployed in U S WEST's network in Minnesota will meet the least cost criterion.

86. In contrast to SCM, HAI does not explicitly model switch deployments; it simply estimates least cost, forward looking switch costs. Since the purpose of the proceeding is to estimate costs, there is no requirement that a switch costing module actually place particular switches; it is sufficient to estimate switching costs.

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[88] Tr. Vol. 3 at 158.
[89] Ex. 314 at 17-18; Ex. 319 at 3.
[90] Ex. 603 at 13; Ex. 150 at 6.
[91] Ex. 604 at 12.
[92] Ex. 603 at 41.
[93] Ex. 634 at 973.
[94] Ex. 314 at 17-18.
[95] Ex. 603 at 13.
[96] Ex. 634 at 955.

87. The FCC found that both the HAI switching module and the SCM were acceptable for use in its Universal Service platform, but chose HAI over BCPM for the switching function because HAI was less complex and because it more fully satisfied the requirement that data, computations, and assumptions be available for review and comment.[97]

88. US WEST witness Mr. Wiseman suggests that the HAI Model does not incorporate "a reasonable level of Minnesota specific engineering detail" in its switching costs. But the evidence here is that U S WEST switch contracts are not state-specific. So there is no such thing as Minnesota-specific switch costs. Moreover, the NBI data used by the HAI Model *includes* information on switches purchased by U S WEST. Thus, the HAI Model data does reflect recent switch purchases made by U S WEST.[98] The evidence in this record shows that the HAI switch cost estimates are more accurate than the SCM model's estimates.

HAI Input Values

Common Overhead, Network Support, Cost of Capital

89. The HAI model was filed with default values for its inputs. More accurate cost estimates can be obtained by replacing a number of the HAI's default input values with different values. For reasons discussed below, the ALJ recommends a common overhead rate of 13.09%, a network support factor of 85%, and a cost of capital of 9.6% for both the HAI model and the AT&T NRCM.

Allocation of Common Costs

90. If common costs are assigned to loops in different density zones based on investment, rural loops with greater levels of investment per loop will be allocated a greater dollar amount of common cost than will urban loops. For example, if common overhead costs are allocated based on investment, there is $.62 per month in common cost allocated to an unbundled loop in areas with 10,000 or more lines per square mile compared with $18.39 per month in common cost allocated to unbundled loop in areas of 0.5 lines per square mile. If common costs are allocated to the loop based on access lines instead, using the same assumptions, each loop is allocated $1.70 in common cost.[99]

91. There is little relationship between common costs and level of investment. General support expenses, network operations expenses, and other taxes should be allocated to the loop based on access lines rather than investment. Unless the expense is a function of the level of investment, the allocation of these expenses based on investment will distort geographic deaveraged loop costs. There are significant cost differences between these methods of allocating these expenses to the loop.[100] The ALJ concludes that allocating the same dollar amount of general support expenses, network operations expenses, other

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[97] Fifth Report and Order, ¶¶ 75-80.
[98] Ex. 319 at 4.
[99] *Id.*
[100] *Id.* at 28-29.

taxes and common overhead costs to each loop in the HAI is the correct method to use in developing geographically deaveraged loop costs.

Depreciation

92. Minn. Stat. § 237.12, subd. 4, requires that "forward-looking depreciation rates" be used in estimating the prices for interconnection and network elements. In its August 15, 1997 filing in Doc. No. P421/D-891, the Department recommended forward-looking, economic depreciation lives and salvage values for U S WEST. The Department's recommended lives and values are set forth in Ex. 621, EF-2.

93. Copper cable represents approximately 50% of U S WEST's total loop investment in RLCAP.[101] U S WEST assumes a 15-year life for buried cable. The company estimates that aerial and underground cable will last only 75% as long as buried cable.[102] The Company seeks 11.3 year lives for these two kinds of cable.[103]

94. U S WEST relies heavily on a 1995 publication by Technology Future, Inc. (TFI). TFI projected a 20-year life for buried distribution copper cable, which U S WEST shortened to 15 years, claiming that was necessary to translate TFI's depreciation study to a forward-looking scenario.[104] For aerial copper and underground copper U S WEST proposed 11.3 years. U S WEST witness Mr. Easton defended the shorter life for aerial copper because of exposure to the elements and the shorter underground copper life because urban interoffice and feeder route cabling are going to be more quickly replaced by fiber.[105] His explanation does not explain why such diverse factors result in exactly equal lives for different kinds of cables.[106]

95. U S WEST also relies on comparisons to depreciation lives of AT&T, ELI, TCG, Phoenix Fiber, and McLeod.[107] However, none of these companies are local exchange carriers. Rather, they are competitive access providers who have deployed fiber in high density areas.[108]

96. Several considerations must be borne in mind in evaluating U S WEST's proposed lives and salvage values. First, the development of new technologies that permit wideband services to be provided over copper cable suggests that copper may have a longer life than that proposed by U S WEST.[109] Second, the TFI report is "too speculative to be used as evidence to support the very short lives proposed by U S WEST."[110] The sponsors of

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[101] Ex. 351 at 4.
[102] Ex. 142 at 5.
[103] Ex. 623 at 6.
[104] Ex. 142 at 8.
[105] Tr. Vol. 4 at 114.
[106] Tr. Vol. 4 at 115-6.
[107] Ex. 142 at 16.
[108] Ex. 623 at 6.
[109] Ex. 503A at 31.
[110] Ex. 621 at 23.

the report are incumbent local exchange carriers who, like U S WEST, have a strong financial interest in increasing depreciation expenses.[111]

97. AT&T and MCI recommend the lives and salvage values approved by the FCC in 1995 for U S WEST. However, no evidence suggests that these values developed for use in rate of return proceedings are forward-looking, economic values.[112] Like U S WEST, AT&T and MCI are also financially interested parties, but their interest is to underestimate depreciation expense.

98. The Department's proposed depreciation values are those it advocated on August 15, 1997, before the Commission in U S WEST's most recent depreciation case before the Commission. These values are forward-looking, economic depreciation values, developed by the Department, a party whose bias is toward the "public good" and achieving the telecommunication goals set forth in Minn. Stat. § 237.011. The ALJ adopts these depreciation rates.

Labor Costs

99. Dr. Fagerlund testified that the regional labor adjustment factor of 0.99 for Minnesota should be used because labor costs in Minnesota are one percent less than the default level for labor costs in HAI. This factor adjusts the wage portion of facility installation costs. The Department used this factor in its HAI model runs.[113] The Administrative Law Judge recommends that it be adopted by the Commission.

Drop Lengths

100. A significant factor in estimating drop costs is the length of the drop. The HAI model permits users to set drop lengths by density zone.

101. Mr. Legursky performed his own analysis of the HAI drop lengths because the HAI sponsors' decision to count special access lines on a circuit-equivalent basis and then to multiply the default drop length by the number of lines per density group was likely to skew the state-wide average drop length that could be calculated from the model. Because the BCPM counts access lines on a pair equivalent basis, Mr. Legursky used its data for lines per density group. Multiplying the HAI default drop lengths for each density group by the BCPM line counts yielded an average drop length of 74 feet.[114]

102. U S WEST witnesses Mr. Schmidt and Dr. Fitzsimmons both criticize the HAI drop lengths as too short.[115] Mr. Schmidt supervised a survey for U S WEST that indicated an average loop length of 171 feet. He had U S WEST technicians visually estimate drop lengths on all visits to customer premises.[116] On the basis of Mr. Schmidt's survey, Dr. Fitzsimmons testified that the Department's recommended average length of 95 feet

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[111] Ex. 623 at 7, Tr. Vol. 13 at 128.
[112] Ex. 621 at 22.
[113] Ex. 621 at 25-26.
[114] Ex. 603 at 45.
[115] Ex. 187 at 4. Ex. 176 30-31.
[116] Ex. 603 at 45.

was unreasonable.[117] In fact, Mr. Legursky recommends an average drop length of 109 feet.[118] In his analysis of HAI, Dr. Fitzsimmons uses an average drop length of 129 feet that he obtained from the BCPM default values.[119]

103. Mr. Schmidt's survey was not sufficiently reliable to be used for calculating drop costs in this proceeding. The survey was quite haphazard, not random, not tested, not uniform, and subject to gross estimations by the data collectors.

104. Neither should the BCPM default drop lengths be adopted as suggested by Dr. Fitzsimmons. The length of drops in BCPM is determined by lot size.[120] The ultimate grid is divided into four quadrants and within each quadrant, a road-reduced area is formed that is into lot sizes from which drop lengths are calculated. The drop length in BCPM thus depends on the assumption made that sizes the road-reduced area. An assumption of a 600-foot buffer would increase drop length while assuming a 400-foot buffer decreases drop length.

105. Contrary to Dr. Fitzsimmons' recommendation to put the BCPM default drop lengths into the HAI model, Mr. Legursky sought to develop appropriate drop lengths. Mr. Legursky testified that he was influenced in his judgment as to the correct average drop lengths by Mr. Schmidt's testimony but that he took those numbers with a "grain of salt."[121] Mr. Legursky estimated the drop length required for the least dense zones, taking into account typical setback distances and distribution cable locations, and derived an average length of 250 feet. The HAI default value for the least dense zone is 150 feet. Mr. Legursky accepted 50 feet as a reasonable average drop length for the most dense zone and figured a smooth curve between 250 foot value and the 50 foot value for the intermediate density zones.[122] Mr. Legursky calculated the correct weighted average drop length to be 109 feet, an increase of 47% over the HAI default value. Mr. Legursky's recommended drop length by density zone is given in Table 1.

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[117] Tr. Vol. 2 at 218.
[118] Tr. Vol. 2 at 226-27; Ex. 603 at 46.
[119] Tr. Vol. 2 at 218
[120] Tr. Vol. 2 at 224.
[121] Ex. 634 at 981.
[122] Ex. 634 at 1052-53; JWL-2 Table A17.

Table 1
(Ex. 604, JWL-2; Ex. 607 at 15)

Density Group	HAI 5.0 Default	Recommended Drop Length	Recommended % of Buried Drop
0-5	150	250	0.84%
6-100	150	200	0.88%
101-200	100	150	0.93%
201-600	100	125	0.95%
601-800	50	110	0.92%
801-2550	50	90	0.83%
2551-5000	50	80	0.74%
5001-10,000	50	70	0.50%
10,000+	50	50	0.25%

106. Table 1 also gives Mr. Legursky's recommendation for the percentage of drops that should be buried. Mr. Legursky's recommendation reflects the fact that many multi-tenant buildings will have no drops and that in many less dense areas, significant land areas will be unutilized. Because aerial drops are less expensive than buried drops, increasing the percentage of aerial drops corrects for the fact that the HAI model overstates drop costs.[123]

107. In the Universal Service docket, the ALJ recommended that the Commission adopt Dr. Fitzsimmons' drop lengths rather than Mr. Legursky's. The ALJ has reconsidered that position and, based upon the additional evidence presented here, recommends adoption of the Department's recommended drop lengths and placement percentages.

Placement Mix

108. Cables may be hung on poles, buried in a sheath, or placed underground in conduit. Mr. Legursky testified that the HAI uses too high a percentage of aerial placement. Local governments are increasingly prohibiting the aerial placement for aesthetic and safety reasons. Because aerial placement is frequently the least expensive type of placement, the HAI consequently understates costs.[124]

109. The FCC's scorched node assumption does not provide much assistance in determining the appropriate placement mix. It can be argued that telephone poles are scored, too. But, if even just electric company utility poles remain in place after scorching, there will be a great incentive to hang cables from them. While communities might find aerial placement unsightly, they will no doubt prefer adding a telephone wire to the electric wires to having streets torn up to place cable underground. As with the structure sharing assumptions discussed below, the scorched node concept in the placement context leads to unproductive debate.

110. In preference to debating how something that will never happen might affect placement mix, the Department has recommended that the most best estimate of what an

[123] Ex. 607 at 15-18.
[124] Ex. 603 at 51.

efficient, forward-looking competitive firm would experience is the recent experience of a competitive firm in Minnesota that provides local service. The ALJ adopted that position in the Universal Service docket. The Department looked to U S WEST's recent experience as a starting point for modeling purposes.[125] Mr. Legursky examined U S WEST's current copper placement mix for copper plant and used the HAI Investment Input Worksheet to determine the percentage of distribution and copper and fiber feeder cable in each density group.[126] He then produced a table for distribution plant and a table for each kind of feeder plant by setting the structure mix percentage for each density group in such a way that when those percentages are applied to the each density group's distribution and feeder cable amounts, the resulting weighted averages for the percent of distribution and feeder cable by structure type matches U S WEST's recent structure placement percentages. The recommended input values for the percentage of distribution placement by density zone and placement type are given in Table 2 below. Table 3 gives the same information for copper feeder placement and Table 4 provides the same information for fiber feeder.

Table 2
(Ex. 604 JWL-2, Table A13)
Recommended Structure Types For Distribution

		Recommended Values			Recommended Values		
Density Zone	% Distribution	Aerial	Buried	Under-ground	Aerial	Buried	Under-ground
0 to 5	16.61%	16.0%	79.0%	5.0%	2.7%	13.1%	0.8%
6 to 100	36.42%	12.0%	81.0%	7.0%	4.4%	29.5%	2.5%
101 to 200	6.52%	7.0%	83.0%	10.0%	0.5%	5.4%	0.7%
201 to 650	11.32%	5.0%	83.0%	12.0%	0.6%	9.4%	1.4%
651 to 850	2.22%	3.0%	84.0%	13.0%	0.1%	1.9%	0.3%
851 to 2550	14.65%	2.0%	85.0%	13.0%	0.3%	12.4%	1.9%
2551 to 5000	8.10%	1.0%	85.0%	14.0%	0.1%	6.9%	1.1%
5001 to 10,000	2.94%	1.0%	84.0%	15.0%	0.0%	2.5%	0.4%
> 10,001	1.23%	0.0%	84.0%	16.0%	0.0%	1.0%	0.2%
Total	100.00%				8.4%	82.2%	9.4%

[125] Ex. 621 at 10.
[126] Ex. 603 at 52-53; JWL-2 tables A11-A16.

Table 3
(Ex. 604 JWL-2, Table A14)
Recommended Structure Types for Copper Feeder

		Recommended Values			Weighted Average		
Density Zone	% Distribution	Aerial	Buried	Under-ground	Aerial	Buried	Under-ground
0 to 5	37.61%	11.0%	84.0%	5.0%	4.1%	31.6%	1.9%
6 to 100	39.79%	8.5%	84.0%	7.5%	3.4%	33.4%	3.0%
101 to 200	2.46%	7.0%	83.0%	10.0%	0.2%	2.0%	0.2%
201 to 650	4.42%	6.0%	81.0%	13.0%	0.3%	3.6%	0.6%
651 to 850	1.05%	5.0%	79.0%	16.0%	0.1%	0.8%	0.2%
851 to 2550	7.44%	4.0%	76.0%	20.0%	0.3%	5.7%	1.5%
2551 to 5000	4.23%	3.0%	73.0%	24.0%	0.1%	3.1%	1.0%
5001 to 10,000	1.86%	2.0%	70.0%	28.0%	0.0%	1.3%	0.5%
> 10,001	1.15%	0.0%	68.0%	32.0%	0.0%	0.8%	0.4%
Total	100.00%				8.4%	82.2%	9.4%

Table 4
(Ex. 604 JWL-2, Table A16)
Recommended Structure Types For Fiber Feeder

		Recommended Values			Weighted Average Values		
Density Zone	% Feeder	Aerial	Buried	Under-ground	Aerial	Buried	Under-ground
0 to 5	37.61%	0.1%	78.0%	21.9%	0.0%	29.3%	8.2%
6 to 100	39.79%	0.2%	65.0%	34.8%	0.1%	25.9%	13.8%
101 to 200	2.46%	0.5%	54.0%	45.5%	0.0%	1.3%	1.1%
201 to 650	4.42%	1.0%	44.0%	55.0%	0.0%	1.9%	2.4%
651 to 850	1.05%	1.0%	34.0%	65.0%	0.0%	0.4%	0.7%
851 to 2550	7.44%	0.0%	25.0%	75.0%	0.0%	1.9%	5.6%
2551 to 5000	4.23%	0.0%	20.0%	80.0%	0.0%	0.8%	3.4%
5001 to 10,000	1.86%	0.0%	15.0%	85.0%	0.0%	0.3%	1.6%
> 10,001	1.15%	0.0%	10.0%	90.0%	0.0%	0.1%	1.0%
Total	100.00%				8.4%	82.2%	9.4%

111. HAI allows users to input structure mix percentages. HAI also includes a structure shifting feature that, under certain conditions, changes the user specified structure mix and shifts plant from buried to aerial.[127] This feature must be disabled to ensure that a recommended structure mix is actually implemented. The ALJ recommends the Commission adopt the Department's recommended structure mix. The Commission should also direct that the structure shifting feature be disabled.

Structure Sharing

112. Structure sharing refers to the possibility that telephone companies may be able to share construction costs for placing outside plant with other companies. Utility poles may support power cables and CATV coaxial cable in addition to telephone lines. Similarly, trenches can be dug wider or deeper, or larger conduits installed, to permit multiple parties to share costs. For reasons similar to those discussed in the modeling of plant mix and installation costs, the FCC has tentatively concluded that the chosen model should permit sharing levels to vary according to installation activity, terrain conditions, and line density zones.[128] The FCC's conclusion in the context of universal service is also applicable, although certainly not binding, to this proceeding.

[127] Ex. 615 at 41-42.
[128] FNPRM, ¶ 79.

113. HAI permits sharing to vary by line density zone.[129] The structure sharing assumption has a significant impact on outside plant costs.[130]

114. The FCC tentatively concluded that 100% of the costs of plowing in buried cable should be borne by the telephone company and that generally, 66% is an acceptable aggregate default value for the percentage of structure costs borne by the telephone company.[131] Again, these percentages are just as relevant to this proceeding as they are to universal services.

115. The telephone network is not going to be scorched and we will never know what structures might have evaporated along with the cable and other equipment. Although the scorched node concept of the FCC provides useful guidance for cost modeling on many issues, the FCC has not developed the concept in the context of structure sharing. This lack of direction permits the parties to this proceeding to take very different positions as to the sharing opportunities available to carriers in a scorched node framework.

116. The HAI sponsors contend that an efficient carrier would aggressively seek out sharing opportunities and would need to absorb only 33% of structure costs. U S WEST assumed to the contrary that there would be little sharing in the scorched node context because only telephone facilities are "scorched."[132]

117. It is appropriate to set UNE prices so as to minimally distort the economic signals that guide the decisions of entering carriers to place facilities while not diminishing the incentive for incumbent carriers to improve the efficiency of their operations.[133] In light of these goals, it is inappropriate to have little structure sharing and have high UNE prices simply because pavement has been laid over cable buried years ago. It is more expensive to bore under a road than it is to plow cable in a green field, it is economically irrational to bore in cable when existing cable is perfectly serviceable, and it is economically irrational to reward an incumbent carrier higher UNE prices to compensate for costs the incumbent never incurred. The decision on this issue should be based on what efficient forward-looking carriers are experiencing in the way of structure sharing today.[134]

118. On this basis, the Department contends the appropriate percentage of structure cost the telephone company should absorb in aggregate is 66%. Ex. 603 at 48. This is the roughly the midpoint of the percentage range of sharing that Mr. Kaalberg, Network Service President of McLeod USA, testified to the Iowa Commission that his company was able to achieve as a result of its aggressive search for sharing opportunities. It is also the sharing percentage recommended by Sprint and by the Federal-State Joint Board in the universal service context. FNPRM, ¶ 78. The ALJ recommends the Commission adopt the sharing percentage of 66%.

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[129] Ex. 615, Appendix B at 13, 18.
[130] Ex. 623 at 6.
[131] FNPRM, ¶¶ 80-81.
[132] Ex. 603 at 48.
[133] See, e.g., First Report and Order, ***Implementation of the Local Competition Provisions in the Telecommunications Act of 1996***, CC Docket No. 96-98 (Aug. 8, 1996) at 620; Ex. 621 at 30.
[134] Ex. 621 at 10.

Buried Placement

119. The costs of placing cable underground are significant and include the costs of trenching, filling, and restoring the surface to its original condition. These costs will vary by density zone. It will be more expensive to dig and restore as the distribution area becomes more dense.

120. HAI permits placement costs to be varied by density zone. The record however does not support the adoption of HAI's default proposed costs for buried placement. The Department advocates averaging placement values of HAI with those of BCPM across the lowest seven density zones and accepting the BCPM values in the two highest density zones to avoid a major discontinuity in the rate at which costs increase with density. The more gradual rate of increase is consistent with Mr. Legursky's experience of how such costs should vary across density groups.[135] Table 5 provides the Department's recommended values. Mr. Legursky developed these values by appropriately changing the underlying parameters of percentages of installation by installation method.

Table 5
(Ex. 604 JWL-2 Table A20)
Recommended Buried Placement Cost Targets

Density Group	HAI Default	Distribution	Feeder
0 to 5	$1.77	$1.62	$1.60
6 to 100	$1.77	$1.79	$1.79
101 to 200	$1.77	$3.12	$2.62
201 to 600	$1.93	$3.83	$3.53
601 to 800	$2.17	$5.22	$4.64
801 to 2550	$3.54	$5.90	$5.32
2551 to 5000	$4.27	$6.49	$6.45
5001 to 10,000	$13.00	$9.47	$9.72
10,000 +	$45.00	$10.41	$10.80

121. Dr. Fitzsimmons criticized Mr. Legursky for placing equal weight on the unsupported national default values in the HAI model with the values in BCPM, which are based on U S WEST's actual contracted prices in Minnesota.[136] However, Dr. Fitzsimmons did not verify the placement costs used in BCPM,[137] is not experienced in placing cable, and is not an outside plant engineer.[138] Again, the ALJ finds Mr. Legursky's position more acceptable. The ALJ recommends the Commission adopt the placement costs advocated by the Department.

[135] Ex. 603 at 49-50.
[136] Ex. 108 at 11.
[137] Tr. Vol. 3 at 24.
[138] Tr. Vol. 2 at 229.

Channel Unit Investment

122. Fiber cable requires digital loop carrier (DLC) to convert optical signals into electrical impulses. Although HAI appropriately models DLC deployment, its default values for the DLC POTS channel unit is too high. Mr. Legursky obtained information about U S WEST's actual cost for such cards in August 1997. On this basis, Mr. Legursky recommended reducing the HAI POTS channel unit price. His recommendation is proprietary and is set forth in Legursky Direct Testimony, Ex. 603 at 53-54. The ALJ supports this recommendation.

Recommended Modifications To HAI

Dedicated Idle

123. Dedicated idle lines should be included in the model. Their existence permits customers to move among existing locations without requiring the construction of new access lines. Although the costs of these lines should be included in computing total UNE costs, these lines should not be counted in computing average costs because they do not generate revenue. The count of dedicated idle lines could be added to current demand and the resulting costs could be divided by current demand only.[139] Dedicated idle lines are the difference between the total count of assigned lines and the total count of working lines.[140] Dr. Fagerlund applied this definition to data submitted with U S WEST's RLCAP study to determine that approximately four percent of U S WEST's lines are dedicate idle lines.[141] The ALJ accepts this estimate.

Treatment Of Special Access Lines

124. This second line count issue involves how special access lines should be counted. Special access lines are non-switched lines that provide high speed digital services, analog and digital data circuits, private-line, and other services. Some special access lines require a single pair, but others, including all digital services, require two pairs. The HAI permits the user to input the number of special access lines. The number of special access lines is important because of economies of scale in the construction of telephone networks. Larger numbers of special access lines will result in lower average costs per line.[142]

125. It is the Department's position that special access lines should be counted one way in the distribution plant and another way in the feeder plant. In the distribution plant, special access lines should be counted on a "pair-equivalent" basis. That is, two pairs of wires (a four-wire circuit) should be counted as two lines regardless of how many circuits may actually be provided to customers over that facility. For example, a DS1 circuit is capable of providing up to 24 circuits or "lines" for customers but it only requires two pairs of wires in the distribution plant.[143] Since only two pairs of wires need be installed in the distribution

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[139] Ex. 623 at 14-15.
[140] Ex. 504 at 10, n. 1.
[141] Ex. 623 at 15.
[142] Ex. 603 at 43.
[143] Ex. 603 at 44.

plant to provide a DS1 circuit, only the costs of installing those pairs should be included in total facilities costs and not the cost of installing a cable of 24 or more pairs or lines. On a pair equivalent method of calculation, there are about 170,000 special access lines in U S WEST's territory in Minnesota.[144]

126. In the feeder plant, however, a different counting method, a "circuit-equivalent" method, is appropriate. Special access lines provisioned over fiber-fed digital loop carrier do not require cable pairs. For example, to operate at full capacity, a DS1 circuit in the feeder plant requires that 24 channels of the fiber's total channel capacity be available to it. Unlike distribution plant where a two-pair cable may provide 24 "lines" of services, in the feeder plant, 24 channels are needed to provide 24 "lines" of services. On a circuit-equivalent method of calculation, there are about 616,000 special access lines in U S WEST's territory in Minnesota. *Id.*

127. HAI permits special access lines to be input on either a pair or voice grade channel basis. However, the model will use that number both in the distribution and in the feeder plant. *Id.* The Department accordingly advocated in the universal service cost model selection proceeding that AT&T and MCI as HAI model sponsors be directed to change the model to permit special access lines to be counted one way in the distribution plant and another way in the feeder plant.

128. In response to the Commission's order recommending the HAI model to the FCC for use in calculating Minnesota universal service costs, AT&T developed a method to run the HAI model twice to get the correct result. This method also incorporates the modification for dedicated idle discussed above. The ALJ recommends the Commission approve the Department's approach and the method to implement it developed by AT&T. The Commission should direct U S WEST to provide the necessary information.

The Model Should Correctly Calculate Line Card Costs.

129. U S WEST witness Dr. Fitzsimmons and AT&T/MCI witness Mr. Denney agreed that the HAI underestimates the cost for the line cards in the distribution model.[145] Although not part of the record in this proceeding, Mr. Denney has developed a simple fix for the model where the line card investment is developed for the same number of lines that are used in the denominator to develop the per line cost estimates. This correction will add on average from about $.05 to $.10 to the monthly cost of the loop. The ALJ recommends that the compliance run of the HAI model include this correction.

The Model Should Be Run With Accurate Line Count Data

130. The ALJ also adopts the Department's position that the HAI model can be run with actual line counts by wire center.[146] The use of accurate line counts at the wire center level will improve the accuracy of the model's cost estimates.[147] U S WEST should supply the

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[144] *Id.*
[145] Tr., Workshop, at 181.
[146] Tr. Vol. 3 at 18-19.
[147] Ex. 621 at 28.

special access line counts data to be used in the model.[148] Finally, the 32 exchanges recently sold by U S WEST should be removed from the model.

GEOGRAPHIC DEAVERAGING

131. The HAI estimates costs at the cluster level. It can then report those costs by cluster or, by accumulating appropriate clusters, by CBGs, wire centers, density levels, or company wide. In theory, it is possible to set prices at any of those levels or groupings. Pricing at the cluster level would be very difficult because it would be very difficult to identify customers to the appropriate PNR cluster. Moreover, as discussed above, there is not sufficient accuracy of the cost estimates at the cluster level; sufficient confidence in the cost estimates only exists when clusters are accumulated to the wire center level. Similarly, actual line counts exist only at the wire center level. Similar accuracy problems exist for CBGs, which may be about the same geographic size or only slightly larger than an HAI cluster. Density levels cannot be used because they are not geographic areas at all, but physically separate clusters with similar densities that may be located anywhere in the company's service area. To use them would also require the ability to identify customers to particular HAI clusters and confidence in the accuracy of individual cluster cost estimating. Thus, at the present time, prices can only be "deaveraged" (actually, accumulated) to the wire center level or must be set on a company-wide basis.

132. Deaveraging UNE rates without deaveraging retail rates would allow CLECs to capture U S WEST's low cost customers and leave U S WEST serving only its high cost customers. Such a situation would create pressure to deaverage retail rates. In the absence of Universal Service support, high cost customers, primarily rural customers, would pay significantly more for service than low cost, primarily urban customers. This situation would violate section 254(b)(3) of the Act, which requires rates in rural areas be reasonably comparable to urban rates. Development of geographically deaveraged UNE prices must be coordinated with Minnesota's Universal Service Support program, which has not yet commenced.[149]

COST FACTORS

HAI Overhead Cost Factor.

133. The corporate overhead or common overhead factor represents those costs that are common to the production of all elements of the firm and do not vary based on the quantity produced of any single element. The network operations factor recovers cost associated with power, provisioning, engineering, and network administration expenses.[150]

134. AT&T developed a 10.4% overhead cost factor based on data filed on Form M of AT&T's annual report to the FCC for the year ended December 31, 1994. However, the telecommunications industry is rapidly changing. Changes in the industry will result in changes in costs. Data from 1994 is stale and should not be used as the basis for

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[148] Ex. 641.
[149] Ex. 622 at 7.
[150] Ex. 609 at 14.

developing forward-looking costs in a 1997 cost study. Moreover, there is no reason that the common overhead factor advocated by AT&T based on its costs as an interexchange carrier is a reasonable proxy for the common overhead factor of an efficient local exchange carrier in a competitive market.[151]

135. The HAI 10.4% overhead factor is applied against annual capital costs plus network expenses, support expenses, and other taxes. Yet, the overhead factor is calculated as a percentage of revenue. Department witness Doyle testified that since the overhead cost factor is applied to an expense number, the factor should be developed as a percentage of total expenses plus return on equity and debt capital rather than total revenue. Mr. Doyle noted that the HAI model allows the input factor for the corporate overhead factor to be changed to a factor based on total expenses without making other changes to the model.[152]

136. While there are various accounts included by U S WEST in its common cost factor that are not included in the HAI common overhead factor, these accounts have not been ignored by the HAI model. Rather, HAI includes these accounts in other parts of the model such as "Supporting Network Expenses, Network Support." The HAI model includes all the appropriate expense accounts in the cost of network elements.[153]

Overhead Factor.

137. Department witness Doyle developed a common overhead factor of 13.09% based on allowable common overhead costs as a percentage of total expenses plus return on equity and debt capital less common overhead costs.[154]

138. Mr. Doyle developed the factor by compiling each of the accounts that U S WEST uses in the development of its common, attributed, and administrative cost factors. He identified the dollar amount associated with each of the accounts based on 1996 ARMIS data from Minnesota, eliminated accounts that are recovered elsewhere, excluded unrelated accounts, and made adjustments to account for costs that are attributable to the provision of retail service. Mr. Doyle then appropriately calculated the overhead expense factor as a percentage of total expenses plus return on equity and debt capital.

139. The overhead factor developed by Mr. Doyle accounts for efficiencies that are anticipated to result from competition for local service. The overhead factor is a percentage applied to annual capital costs plus network expenses, support expenses, and other taxes. To the extent that any of the components to which the factor is applied have been reduced, the total overhead costs are also reduced.[155]

140. In addition, uncollectibles are included in the annualized direct cost of the unbundled network elements. To recover uncollectibles in the common overhead factor would result in double recovery of this account and thus, this account must be excluded.

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[151] *Id.* at 15.
[152] Ex. 609 at 15.
[153] *Id.* at 16-17.
[154] Ex. 613 at 6.
[155] *Id.* at 21.

141. The overhead expense factor calculation should include return on equity and debt capital in the denominator since the factor is applied to expenses plus return on equity and debt capital in the HAI model. The calculation should also reflect a return on rate base using the 9.60% overall cost of capital and a rate base of $1,207,192,007.00 as reported by U S WEST in its 1996 annual report filed with the Department. These modifications result in a common overhead factor of 13.09%.[156] The ALJ finds that the overhead factor calculated by Mr. Doyle is appropriate and recommends that the Commission adopt it.

Network Operations Expense.

142. Network operations consist of provisioning expenses, power expenses, network administration, testing, plant operations administration expense, and engineering. Of these accounts, testing, plant operations administration expense and engineering make up approximately 85% of the total of network operations expenses. While the parties all agree that U S WEST's historical data should be used as the proxy to determine network operations expense, they disagree on the network operations factor to be applied to that data to reflect the expense that should be used in a forward-looking cost study.

143. The HAI model adjusts U S WEST network operations expenses by 50% to reflect efficiencies in network operations that may occur in a competitive environment. The HAI sponsors support their proposal for a 50% reduction of U S WEST's network operations expense factor by contending that new technologies being used will reduce labor costs. The HAI sponsors also state that network operations expenses have declined over the past several years and that this trend should continue as modern systems and technologies are deployed. While they have demonstrated that some of amount of savings should be recognized, they provide no quantitative support for their proposal of a 50% factor.[157]

144. U S WEST claims that it is an efficient operator and that no reduction from its historical cost should be made. That extreme position is contrary to the evidence here.

145. The Department's position is that the value should represent the network operations expenses of an efficient firm operating with the best available technology.[158] To make such a determination, Department witness Doyle compiled Minnesota-specific data for each of the accounts included in network operations expenses for the years 1990 through 1996, as presented in U S WEST's annual report filed with the Department.

146. The 1996 ARMIS data reflect approximately $90 million in network operations expenses. If the Commission were to adopt the 50% factor advocated by AT&T and MCI, the network operations expenses used in the HAI model would be approximately $45 million dollars. Even if U S WEST were operating efficiently with the best available technology, to set network operations expenses at $45 million for the purpose of establishing the cost of unbundled network elements is not reasonable given the historical experience of the accounts. The history of network operations expenses in Minnesota revealed that the total expense has generally increased each year, contrary to the claims of

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[156] Ex. 613 at 7.
[157] Ex. 609 at 23.
[158] Ex. 613 at 9; Ex. 621 at 7.

the HAI sponsors. There have been reductions in testing and engineering expense accounts, but such reductions have been offset by significant increases in plant operations administration expenses.[159]

147. A reasonable estimate of the network operations factor to use in the HAI model should be closer to the position of U S WEST than AT&T/MCI. Based on the past experience of these accounts, a value of 85% of the 1996 ARMIS data is reasonable data for use in the HAI model. Mr. Doyle came to the opinion based on his review that a factor of 85% provides a reasonable estimate of network operations expenses.[160] The ALJ agrees.

Cost Of Capital

The Department's Analysis

148. Based upon the testimony of Department witness Stephen Hill, the ALJ Finds U S WEST's Forward-Looking Cost Of Capital Is 9.60% which is based upon consideration of 1) two sample groups of market-traded firms whose operational risk brackets that of U S WEST's local loop operations (gas distribution companies and the former-Bell regional holding companies) and 2) a reasonable range of capital structures based on both book and market values of similar-risk firms.[161]

149. Interest rates and capital costs have declined and remained very low relative to the interest rate levels that existed in the mid 1980s. Long-term interest rates remain well below the levels that existed during the interest rate lows of 1986 and 1987 (the last substantial trough in interest rates) and the Federal Reserve's monetary policy continues to be more accommodative than it was at that time.[162] In addition, inflation levels are expected to continue to remain at relatively low levels in the future.[163] Simply put, the low levels of inflation and the relatively low interest rates that currently exist are expected to be maintained through the end of the decade. These economic data indicate than the cost of capital is, and will continue to remain, relatively low.[164]

150. Both a market-based capital structure and a book value-based capital structure should be used for calculating a reasonable range of overall long-run incremental capital costs in this proceeding. While there is theoretical support for the exclusive use of a market-based capital structure in a capital budgeting decision process, a more reasonable approach is to consider both market-based and book value-based capital structures to develop a range of overall long-run incremental costs, with the market-based capital

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[159] Ex. 613 at 8.
[160] *Id.* at 10-11.
[161] Ex. 602 at 2-3.
[162] Ex. 600 at 5-6.
[163] Ex. 600 at 4.
[164] *Id.* at 6-8.

structure establishing an upper bound of that range and the book value-based capitalization establishing a lower bound of the range.[165]

151. For an estimate of the market-based capitalization of U S WEST-Minnesota, Mr. Hill accepted the Company's recommended capital structure of 72% common equity and 28% debt. He also accepted, for costing purposes, the Company's estimate of its incremental debt cost, 7.53%.

152. Mr. Hill used the average book value capital structure of the former Bell regional holding companies (RHCs). The RHCs and U S WEST are currently capitalized, on average, with 47.10% common equity and 52.90% debt capital. Mr. Hill uses this current average book value capital structure ratio as well as the Company's requested market-value capitalization in determining an overall long-run incremental cost of capital. The two capital structures (market and book) along with the Company's estimated incremental cost of debt, 7.53%, are shown on page 2 of Schedule 2 of Ex. 601.[166]

153. While a market-based capital structure should be considered in setting long-run incremental costs for the local exchange network, a market-based capital structure should not be given sole consideration in this proceeding. Book-value capital structure must also be given some consideration in determining the Company's long-run incremental capital costs for several reasons.[167] But, capital structure selected for use in this proceeding should be representative of the manner in which U S WEST will actually finance its local loop operations. While the Company could elect to finance its plant investment with the capital ratios evident in its market-based capital structure, the Company is also free to select any other financing mix. In order to estimate a reasonable, forward-looking cost of capital, the actual book value capital structure of similar-risk firms must also be considered.

154. First, the literature of corporate finance supports the use of book-value capital structure as well as market-based capital structure in determining the overall cost of capital.[168] Even advocates of the use of market-based capital structures in theoretical approaches, such as Professor Erhardt (an authority cited by U S WEST witness Cummings), also recognize that book value capital structures can be used to estimate overall capital cost rates for capital budgeting purposes.[169]

155. Second, surveys of financial managers who actually make capital budgeting decisions indicate that they use book-value weights as well as market-value weights for that purpose.[170]

156. Third, investors are exposed primarily to book-value capital structure information in making their assessment of equity investment opportunities, since book-value capitalization data is prevalent in financial reporting, and market-value capital structure

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[165] *Id.* at 18.
[166] *Id.* at 20.
[167] *Id.* at 11-12.
[168] *Id.*
[169] Ex. 602 at 6.
[170] Ex. 600 at 12.

information is not. Moreover, the book value capital structure that the Company reports to the financial community is reasonably associated with the forward-looking costing paradigm at issue in this proceeding because that capital structure reflects the discontinuance of regulatory accounting. Since investors rely on book-value information in making their decisions, and markets are assumed to be informationally efficient, the book-value capital structure data deserves consideration in the estimation of an overall cost of capital.[171]

157. Fourth, U S WEST's actual use of external debt and equity funds in recent financing operations does not support the use of a market-based capital structure as the sole determinant in this proceeding. In capital budgeting, the purpose of a weighted average capital structure is to estimate the overall cost of capital of the particular project being evaluated. The fundamental assumption is that the proportions of the types of capital used in the weighted cost of capital are equivalent to the capital actually used to fund the project. Therefore, the assumption implicit in the use of U S WEST's market-based capital structure is that new plant investment will be made with the same proportion of capital that exists in the market-based capitalization.

158. Mr. Hill reviewed U S WEST's cash flow statement over the last three years to test this assumption. It indicates that the Company has financed its plant with a mixture of capital which is substantially different than its market-based capitalization. The data indicates a ratio of external financing consisting of 27.32% equity and 72.02% debt--almost precisely the reverse of the market-based capital structure with which the Company requests it marginal capital costs be set.[172] Therefore, the assumption implicit in the use of a market-based capital structure, i.e., that the incremental plant added by the Company will be financed in precisely the same proportions as that which currently exists in the market-based capitalization, is not necessarily an accurate assumption. This makes sole reliance on a market-based capital structure for estimating the Company's long-run marginal cost not necessarily representative of those costs. A more balanced approach considers both market-based and book value-based capital structures to estimate the reasonable long-run overall cost of capital.[173]

159. Fifth, book value-based capital structures, as well as market-based capital structures, should be considered in this proceeding because the nature of the costs included in the process of estimating the total element long-run incremental costs in the proceeding are not all forward-looking incremental costs. For instance, the local loop cost estimates presented by the Company, and to a lesser extent by the Department, depend, in part, on embedded costs and factors, not incremental costs. To the extent that costs included in the estimate of local loop costs are embedded costs, consideration of a book value rather than a capital value capital structure is required. Indeed, U S WEST has stated that it believes that it is entitled to the difference between embedded costs and TELRIC in order to have an opportunity to earn a reasonable profit on its book value

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[171] Ex. 600 at 12.
[172] *Id.* at 14-15.
[173] *Id.* at 16.

investment. Therefore, the book value of the Company's local loop assets remains an important decision tool for management.[174]

160. In summary, for the many reasons set out above, the ALJ has considered both market-based capital structures and book value-based capital structures in determining the Company's long-run incremental capital costs. For an estimate of the market-based capitalization, the ALJ recommends the Commission use the Company's recommended capital structure of 72% common equity and 28% debt. The Commission should also use the Company's estimate of its incremental debt cost rate, 7.53%. For an estimate of the book value capital structure, the Commission should use the average book value capital structure of the former RHCs. The average for the RHCs is 47.10% common equity and 52.90% debt capital.

161. Department witness Hill estimated U S WEST's cost rate of common equity capital for the company's telecommunications operations using a discounted cash flow (DCF) model analysis as well as three corroborative analyses. The three corroborative analyses used by Mr. Hill were the modified earnings-price ratio (MEPR) analysis, the market-to-book (MTB) ratio analysis, and the Capital Asset Pricing Model (CAPM) analysis. These independent analyses led Mr. Hill to conclude that a reasonable range for the cost of equity capital for U S WEST ranges from 10.75% to 11.25%, with a mid-point of 11.00%.[175]

162. Under the DCF model, the total return to the investor, which equals the required return, is the sum of the dividend yield and the expected growth rate in the dividend. The growth rate variable in the traditional DCF model is quantified theoretically as the dividend growth rate investors expect to continue into the indefinite future.[176]

163. Mr. Hill used the sustainable growth rate approach to develop an estimate of the expected growth rate in the DCF model. Mr. Hill calculated both the historical and projected sustainable growth rate for samples comprised of the former Bell Regional Holding Companies (RHC) and natural gas-distribution companies. To supplement the sustainable growth rate analysis, Mr. Hill also analyzed published data regarding both historical and projected growth rates in earnings, dividends, and book values for all the companies under study.[177]

164. Mr. Hill selected the RHCs for analysis for the cost of equity capital of U S WEST's Minnesota operations even though there are significant changes occurring in the telecommunications industry that make the RHCs more risky and their equity costs higher than those of local exchange telephone operations such as U S WEST-Minnesota. He did so because an equity cost analysis of the RHCs still offers useful information in estimating the equity capital cost of a telephone utility operation. For example, U S WEST, Inc.'s 1996 Securities and Exchange Commission Form 10-K reports that 78% of its revenues and 82% of its operating income were generated by U S WEST Communications. Since the local exchange operation is a fundamental portion of the business of an RHC, the stock

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[174] Ex. 600 at 17.
[175] Ex. 600 at 49-50.
[176] *Id.* at 20
[177] *Id.* at 21.

price of those firms should be representative of the risk entailed in those operations. Of course, since the RHCs have stepped up diversification efforts by entering such markets as cellular telephone and the entertainment industry, that increased risk and the concomitant higher return expectation is also impounded in the RHC's stock prices. Therefore, while local exchange operations remain at the core of the RHCs and their market data provide a reasonable indication of the cost of equity of that type of firm, those companies also have invested in riskier operations which will raise the market required return for those firms above that of a local exchange telephone company.[178]

165. Because the cost of equity capital estimate derived from RHCs would be greater than is required for a local exchange telephone operation, it is necessary to also analyze a group of companies that are relatively similar in risk to local exchange telephone operations, but have somewhat lower overall risk. Natural gas distribution companies fulfill this requirement. Mr. Hill therefore also analyzed the market data of a sample of gas distribution companies in conducting his DCF analysis.[179]

166. The similarities between gas distribution companies and local telephone companies include the bifurcation of the gas industry and the telephone industry, the ability of customers to bypass both industries in certain circumstances, and similar operational risks. The similarity in operational risks is borne out by the bond rating benchmarks Standard & Poor's publishes for both types of companies. Standard and Poor's interest coverage benchmarks delineate an area in which the risks are essentially the same for gas distribution companies and local telephone companies or telecommunications firms. Natural gas distribution utilities experience some of the same competitive pressures that are expected to exist in the local exchange telephone market. The gas distribution companies are currently unbundling their services to facilitate their customers' purchase of gas from competing companies. However, many of those firms are also retaining aspects of utility operations in that they will be the entity that actually delivers the commodity to the end user. The quasi-competitive/utility situation in the gas distribution industry is similar to that in the local exchange telephone industry. Even though some CLECs may in the future be able to construct parallel telecommunications networks, the traditional local exchange carriers such as U S WEST are expected to remain dominant in the market for local exchange telephone services, and like the gas distributors, will be the conduit through which most end users purchase their telecommunication services. These and other similarities between gas distribution operations and local exchange telecommunication companies described in Mr. Hill's testimony support the use of market data regarding gas distribution operations as useful information in confirming the reasonableness of the lower end of an equity cost estimate range for U S WEST.[180]

167. After determining the companies in his two similar-risk sample groups, Mr. Hill then conducted a sustainable growth rate analysis to determine an internal growth rate from earnings retention for both the RHCs and the gas distribution companies. He then

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[178] *Id.* at 23.
[179] *Id.* at 24.
[180] Ex. 600 at 9.

considered investor expectations regarding growth from external sources (sales of stock) to complete his final DCF growth rate for use to estimate the cost of equity capital. A complete discussion of Mr. Hill's growth rate analysis for each company studied is contained in Exhibit 601, Appendix C.

168. Mr. Hill's DCF growth rate estimate closely approximates publicly available data. Mr. Hill found an average sustainable growth rate estimate for the RHCs to be 8.01%. This compares with Value Line's projected average growth rate in earnings, dividends and book value of 7.99% for the same companies and the average projected Institutional Brokers' Estimate System (IBES) earnings growth rate for those companies of 7.92%. Also, the growth rate average used in Mr. Hill's analysis is much higher than either historical growth rate series shown in his growth rate analysis for all of the companies included in the similar-risk sample group.[181] This indicates that Mr. Hill's analysis is not based only on historical data but takes into account the RHC's increased future growth expectations. Moreover, the data indicates that investors expect higher growth from their telephone company investments than they have achieved in the past.[182]

169. Mr. Hill's average growth rate estimate for the gas distribution companies he analyzed is 5.49%. This figure is higher than Value Line's projected five-year growth rate in earnings, dividends and book value for the same companies (4.95%). The average growth rate used in Mr. Hill's DCF analysis of the gas distributors is substantially higher than Value Line's projected dividend growth for those companies (3.09%) and higher than the projected book-value growth rate (4.55%). On the other hand, his growth rate estimate is lower than IBES's average projected five-year earnings growth rate for those same companies (5.82%). As noted below, some of the earnings growth rate projections are exaggerated by the use of poor earnings years used as a base in the growth rate calculation methodology. Mr. Hill's recommended growth rate is above historical and earnings dividend rates as reported by Value Line as well as the compound historical earnings growth rate shown in his Ex. 601, Schedule 4 at 4.[183]

170. Following his determination of growth rates, Mr. Hill estimated the next quarterly dividend payment of each utility and annualized them to determine the dividend yield. The DCF dividend yield is presented in Schedule 5 of Ex. 601. In deriving the dividend yields presented in Mr. Hill's Schedule 5, he did not adjust the dividend yield to account for quarterly compounding of the dividends because such an adjustment results from an improper interpretation of the theory on which the DCF model is based and serves only to inflate a DCF-determined equity capital cost estimate. The DCF model is a quarterly model, not an annual model, because the dividends are paid quarterly rather than annually. The DCF model implicitly recognizes the quarterly payment of dividends. It does not require any "adjustment" to account for one year's expected growth. *Id.* at 33-36.

171. Mr. Hill's cost of equity capital estimate for the sample group of telecommunications firms and gas distribution utilities using the DCF model shows the average DCF cost of

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[181] Ex. 601, Schedule 4 at 1-4; Ex. 600 at 31-32.
[182] *Id.*
[183] *Id.* at 32.

equity capital for the group of diversified telecommunications firms as 11.61% while the DCF result for gas distribution utilities companies studied is 10.53%.[184]

172. Mr. Hill conducted a modified earnings-price ratio (MEPR) analysis to corroborate his findings and because such an analysis can be a reliable indicator of the proper range of equity costs. The earnings-price ratio, which is one portion of the MEPR analysis, is calculated as the expected earnings per share divided by the current average market price. Further, the earnings-price ratio, itself, is an accurate indicator of equity capital cost rates when the market price of a stock is near its book value. When the market value of a stock is below its book value, the earnings-price ratio overstates the cost of equity capital. Conversely, the earnings-price ratio understates the cost of equity capital when the market price of a stock is above book value.[185]

173. Because of these problems with the earnings-price ratio, Mr. Hill did not use the ratio alone without modification as an indicator of equity capital cost rates. Mr. Hill modified the earnings-price ratio by averaging that parameter with an investor-expected return on equity. This equity cost estimation technique is also termed the "mid-point approach" because the equity cost estimate is the mid-point between the earnings-price ratio and the expected return on equity.[186]

174. The Federal Energy Regulatory Commission used this technique in its generic rate of return hearings indicating that under the circumstances of market-to-book ratios exceeding unity, the cost of equity is bounded above by the expected equity return and below by the earnings-price ratio. The mid-point of these two parameters produces an estimate of the cost of equity capital which, when utilities market-to-book ratios are different from unity, is far more accurate than the earnings-price ratio alone.[187]

175. Mr. Hill testified and the ALJ agrees that the result of the modified earnings-price ratio analysis for telephone companies is not useful because of the accounting changes those firms have undertaken during the last few years. One of the tenets of the modified earnings-price ratio analysis is that the earnings base of the firm is consistent. The telephone companies' election to discontinue regulatory accounting for their utility assets violates that tenet. Therefore, while Mr. Hill testified that the modified earnings-price ratio analysis is a reliable corroborative methodology for utility operations that earn and report equity returns on the same basis such as gas distributors, it is not currently reliable for telephone firms.[188]

176. Mr. Hill shows his results of his modified earnings-price ratio analysis of the cost of equity for the sample groups under study on pages 1 and 2 of Schedule 8 of Exhibit 601. The MEPR results for the telecommunications holding companies are well above the DCF results previously derived by Mr. Hill. In the gas distribution sample group, the mid-point of the current earnings-price ratio is 6.98% and the 2000-02 projected equity return is

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[184] Ex. 600 at 36; Ex. 601, Schedule 6 at 1-2.
[185] Ex. 600 at 36.
[186] *Id.*
[187] *Id.* at 38.
[188] *Id.*

10.04%. These results are below the DCF equity cost estimates for the gas distributors derived by Mr. Hill.[189]

177. Mr. Hill conducted a market-to-book (MTB) analysis of the cost of common equity capital for his sample group. This technique of analysis is a derivative of the DCF model that attempts to compensate the capital cost derived for inequalities which might exist between a firm's market price and its book value per share. Although this method of analysis is derived from the DCF model and therefore cannot be considered a strictly independent check of that method, the MTB analysis is useful in a corroborative sense in that it seeks to determine the cost of equity using market-determined parameters in a different format than that employed in the DCF analysis. In the DCF analysis, the available data is "smoothed" to an extent to identify investor's long-term sustainable expectations. The MTB analysis employed by Mr. Hill relies instead on point-in-time-data projected one year and five years into the future and thus offers a practical corroborative check of the traditional DCF.[190]

178. Mr. Hill derived the MTB cost of equity capital for the RHCs as 12.13% using data from 1997 and 10.84% using data from the 2000-2002 period. The MTB cost of equity for the sample of gas distribution utilities is 10.71% using the current year data and 10.32% using projected data.[191]

179. Finally, Mr. Hill used the Capital Asset Pricing Model (CAPM) to corroborate his estimate of the rate of equity capital for U S WEST. The CAPM states that the expected rate of return on a security is determined by a risk-free rate of return plus a risk premium which is proportional to the systematic risk of a security. Systematic risk refers to the risk associated with movements in the macro-economy and thus cannot be eliminated through diversification by holding a portfolio of securities. The beta coefficient is a statistical measure which is an attempt to quantify the non-diversifiable risk of the return on a particular security against the return inherent in general stock market fluctuations.

180. Mr. Hill used the CAPM in his analysis as one of several checks of the DCF cost of equity estimate. Although he testified that the CAPM is generally useful in estimating the cost of equity capital, certain theoretical shortcomings of this model reduce its usefulness as a stand-alone analytical technique. Ex. 601. According to the National Association of Regulatory Utility Commissioners' annual survey of regulation, the number of utility regulatory commissions in the United States and Canada that list the CAPM as one of the equity cost estimation methodologies to consider is 11, whereas the DCF is utilized by nearly every single regulatory body.[192] Also, beta is the only risk measure used in the CAPM and it is calculated from historical data. Yet, the cost of capital is forward-looking.[193]

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[189] *Id.* at 39-40.
[190] *Id.* at 40.
[191] *Id.* at 40-42.
[192] Ex. 600 at 42-43.
[193] Tr. Vol. 2 at 111.

181. Under the CAPM design, the risk-free rate is that short-term rate of return investors can utilize with certainty. Mr. Hill used the 13-week U.S. Treasury Bill from ***Stock, Bonds, Bills And Inflation: 1997 Yearbook*** by R. G. Ibbotson Associates to determine the market risk premium for his CAPM analysis. That source indicates that the average market risk premium between stocks and T-Bills over the 1926-1996 time period is 8.9% based on an arithmetic average and 7.0% based on a geometric average.[194]

182. Both arithmetic and geometric means are recognized in the financial literature and the financial media as measures of historical returns. Mr. Hill used data coefficients published by Value Line to conduct his CAPM analysis. This data are derived from a regression analysis between weekly percentage changes in the market price of a stock and weekly percentage changes in the New York Stock Exchange Composite Index over a period of five years.[195]

183. The results of Mr. Hill's CAPM analysis of the cost of equity for the RHCs and the gas distributors shows a range of CAPM equity cost estimates for the RHC sample group of 11.30% to 13.01% with a mid-point of 12.16%. His CAPM analysis for the gas distribution group produced a range of equity cost estimates from 9.20% to 10.34% with a mid-point of 9.77%.[196]

184. The results of Mr. Hill's equity capital cost analysis for the sample group of telecommunications holding companies and gas distribution companies is as follows:

METHOD	RHCs	GAS DISTRIBUTORS
DCF	11.61%	10.53%
MEPR	16.62%/13.92%	9.14%/10.04%
MTB	12.13%/10.84%	10.71%/10.32%
CAPM	12.16%	9.77%

185. Mr. Hill's best estimate of an appropriate range of cost of equity capital for a gas distribution operation similar in risk to the companies analyzed is 10.25% to 10.75%. In the case of the gas distributors, the corroborative equity cost estimation analyses produce results which are, for the most part, lower than the DCF estimate. A range of 10.25% to 10.75% gives primary weight to the DCF estimate for the gas distributors and recognizes that the corroborating methodologies produce results both below and above the DCF.[197]

186. As can be seen from the table above, the corroborative methodologies produce estimates for the RHCs that are also both above and below that sample group's DCF equity cost estimate. For reasons of consistency, the Modified Earnings Price Ratio (MEPR) results for the RHCs are reported in the table above, but should be afforded little weight due to the systematic aberrations in reported book returns for those firms. The

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[194] *Id.* at 45.
[195] *Id.*
[196] *Id.* at 48.
[197] *Id.* at 49.

average of the remaining corroborative methodologies (MTB and CAPM) for the RHCs is 11.71%, approximating the DCF result of 11.61%. Therefore, a range of equity capital cost estimates around the DCF result for the RHCs is indicated. Rounding the DCF result up to the nearest 1/4 percentage point, 11.75%, and establishing a 50 basis point range around that equity cost estimate produces a range of equity cost estimates for the RHCs of 11.25% to 12.25%.[198]

187. As noted above, diversified telecommunications holding companies are riskier than local exchange telephone operations. And gas distributors have similar but somewhat less risk than a local exchange telephone operation. Therefore, an appropriate equity return for U S WEST's local exchange operations in Minnesota is below that derived for the RHCs but above that appropriate for a gas distribution operation. Mr. Hill testified that an equity cost range of 10.75% to 11.25% (midpoint = 11.00%) encompasses the equity capital cost estimates of both the gas distribution sample and the RHCs in that it includes the top of the range of the gas distributors (10.75%) and the bottom of the range of equity costs for the RHCs (11.25%). Mr. Hill recommended that the mid-point of that range, 11.00%, be used for cost-setting purposes.[199]

188. Mr. Hill's Schedule 11 shows that, with an allowed return on equity capital of 11.00%, using both a book value capital structure and a market value capital structure, U S WEST-Minnesota's overall cost of capital would range from 9.16% to 10.03%. The mid-point of that range is an overall return of 9.60%.[200] The ALJ recommends the Commission adopt a 9.60% cost of capital rate for U S WEST in this proceeding.

U S WEST's Analysis

189. U S WEST witness Cummings relied on an equal weighting of the results of a DCF analysis and a CAPM analysis to estimate U S WEST's equity capital cost rate. Mr. Cummings' DCF methodology is unsound and his CAPM analysis is flawed. Mr. Cummings' corroborative analyses are similarly flawed and should be rejected by the Commission.[201]

190. U S WEST terms its version of the DCF the "quarterly DCF" model. This version of the DCF model produces cost of equity results which are higher than the standard DCF model.[202] Its complexity makes it doubtful that the average investor actually uses it. It implicitly assumes that dividends increase every quarter, but, that is not the manner in which dividends are actually paid out by utilities.

191. Mr. Hill testified that the projected earnings growth rate should not be used as the only source of a DCF growth estimate as Mr. Cummings did in this case because projected earnings growth rates are influential in, not necessarily determinative of, investor expectations. Moreover, exclusive reliance on analysts' projected earnings growth rates in

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[198] *Id.*
[199] *Id.* at 50.
[200] *Id.* at 51.
[201] Ex. 600 at 53.
[202] Ex. 660 at 54.

a DCF equity cost estimate can produce unreliable results, and the IBES "consensus" growth rate estimates for Mr. Cummings' telecommunications firms are based on projected earnings growth rates which, overall, show a divergence rather than a consensus of investor opinion.[203]

192. In addition to his DCF analysis of telecommunications companies, Mr. Cummings performed a "comparable company" DCF. Mr. Cummings' "comparable company" DCF cost of capital study examines the market data of a group of firms selected by a risk parameter screening process, but only a few of the firms in Mr. Cummings' "comparable risk" group enjoy anything approaching the dominant market position of a local exchange telephone operation and the DCF cost of equity for the competitive firms included in Mr. Cummings' sample group is statistically significantly different from the similar companies which are regulated.[204]

193. The ALJ concludes that the U S WEST DCF analysis should not be relied upon in this proceeding.

194. Mr. Cummings uses the CAPM as a co-equal analytical method to the DCF. In addition to the earlier stated shortcomings of CAPM, there are also aspects of Mr. Cummings' application of the CAPM which causes the result to be overstated.[205]

195. In his testimony, Mr. Hill points out that the use of a long-term Treasury security as the risk-free rate in the CAPM includes a level of inflation-related systematic risk which is not called for in the theory on which the CAPM is based. Brealey & Meyers, a source on which Mr. Cummings relies in his direct testimony in this proceeding, in ***The Principles of Corporate Finance, 4th Ed.*** (McGraw-Hill, New York, p. 194), indicate that the difference between the historical average annual return of T-Bonds and T-Bills should be subtracted from the current T-Bond rate to produce what amounts to a forward-looking T-Bill rate--the proper risk-free rate to be included in the CAPM. Mr. Cummings fails to make such an adjustment, and, in so doing, overstates his CAPM cost of equity by approximately 50 basis points.[206]

196. The betas published by Value Line and Merrill Lynch on which Mr. Cummings relies in his CAPM analysis are "adjusted." That is, once the "raw" beta coefficient is determined through a regression analysis of the relative returns of a stock with a market index (e.g., NYSE or S&P 500), those "raw" betas are adjusted toward 1.0, the market average. This is done to account for a theorized tendency for beta coefficients to approach the broad market average (1.0). So, the betas reported by Value Line and Merrill Lynch are adjusted upward if the raw beta is below 1.0 and downward if the raw beta is above 1.0. Mr. Hill points out in his testimony that unadjusted betas are also published and are available to investors and thus must be considered in the analysis. Standard & Poor's publishes unadjusted betas and those unadjusted beta coefficients are below the adjusted betas

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[203] *Id.* at 55-56.
[204] *Id.* at 55-58.
[205] *Id.*
[206] *Id.* at 59.

used by Company witness Cummings. Consideration of unadjusted betas would cause Mr. Cummings CAPM results to decline by over 100 basis points.[207]

197. As a corroborative analysis, Mr. Cummings performed a DCF analysis on a sub-set of the S&P 500 Index and determined that the cost of capital of the "average" stock is higher than his recommendation for U S WEST-Minnesota and, therefore, he concluded his recommendation is reasonable. Mr. Cummings verified his result that the Company has "slightly" less risk than average by relying on telecommunications firms' beta coefficients, which are below the definitional beta for the market--1.0. As Mr. Hill noted in testimony, in recently published research in the field of theoretical finance, beta has been shown to be an unreliable indicator of relative risk. Therefore, this corroborative analysis suffers from the same shortcomings as the CAPM, i.e., a heavy reliance on the accuracy of beta.[208]

198. In estimating the required return on the market, Mr. Cummings uses a DCF analysis. He uses the IBES projected earnings growth rates for each of the companies in the S&P 500 for which data are available, along with the dividend yield of each and sums the result according to the market weights of each. His result is a DCF cost of equity estimate of about 14%. However, IBES also publishes an earnings growth rate projection for the S&P 500, in aggregate. Currently, that investor service projects that the earnings growth of the S&P 500 over the next five years to be approximately 6%. That growth rate added to an average dividend yield of 3% produces a IBES-supplied DCF cost of equity for the S&P 500 of only 9%--substantially different than the 14% produced by Mr. Cummings' analysis. Widely disparate equity cost estimates arise from witness Cummings' individual-company analysis of the S&P 500 and that produced by considering the S&P 500 in the aggregate, using the same source of growth rate information--IBES. This shows that analysts' projected earnings growth rates are not the only input that needs to be considered when framing the growth rate estimated in a well-reasoned DCF analysis. The difference in the DCF results for the S&P 500 described above is evidence that an unquestioning reliance on one source--without consideration of any other factors--is unwise in equity capital cost analysis.[209]

199. U S WEST witness Cummings' second "corroborative" methodology is another version of his first and suffers from the same shortcomings. The witness subtracts bond yields from his estimate of the market return, multiplies that risk premium by a telecommunications-type beta to arrive at a range of results which coincide with the upper end of his recommended return. As with the previous analysis, however, this risk premium/CAPM analysis does not constitute a check of the reasonableness of the witness' equity cost estimation techniques; it merely indicates that the equity cost he estimates for the market is higher than the cost rate he recommends in this proceeding.[210]

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[207] *Id.*
[208] *Id.* at 60.
[209] *Id.*
[210] *Id.*

Conclusion

200. The ALJ adopts the Department's recommendation to set U S WEST's forward-looking cost of capital at 9.6%. Department witness Hill's reasoned analysis supports such a finding. The parameters used to obtain the 9.6% cost of capital are: 7.53% cost of debt; 11% cost of equity; and a capital structure that is 40.36% debt. Using the 9.6% cost of capital in place of the HM 5.0a default of 10.01% results in a reduction of 17 cents in the average loop cost.

SPOT FRAME

201. Where a physical connection is required to provide access to US WEST's local network, CLEC equipment is connected to US WEST's equipment at US WEST's central office facilities (CO). Some of the specifics of the connections to be made are described in the discussion on collocation, below. MCI and AT&T argue that the network connection should be accomplished by direct connection between with the ILEC circuits for voice grade, DS-1, DS-3, and OC-x (for dark fiber).[211] The connection, as proposed by MCI and AT&T, occurs on the same ILEC equipment used for serving the network.[212]

202. US WEST proposes that the connection between networks be accomplished with a Single Point of Termination frame (SPOT frame). The SPOT frame uses the same sort of equipment used by US WEST in its main distribution frame (MDF). The difference between the two frames is that while the MDF is the direct link between customer loops and the switching equipment of the CO, the SPOT frame is run off of the MDF by jumper cables and tie pairs and connected to US WEST's switching equipment in the same manner. Under that design, the MDF remains undisturbed by activity on the SPOT frame and the SPOT frame may be placed at a distance from the MDF.

203. US WEST asserts that the SPOT frame is needed because:

> Allowing CLECs access to UNEs that is equal to what U S West provides itself would mean that every piece of equipment in U S West's network would be open to dozens of different CLECs. Such direct access would compromise both the security and integrity of U S West's network. Nothing in the Act requires CLECs to have direct or equal access to U S West's switches, main distribution frame ("MDF"), or operational support systems. Access to U S West's network must be restricted.[213]

204. MCI and AT&T identified ten problems that arise from the use of SPOT frames.[214] Service quality problems arise if the SPOT frame is located too far from the MDF. Termination blocks on the SPOT frame must be ordered in blocks of 100, which is a barrier to entry. Capacity will be lacking and no procedures exist to deal with limited

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[211] Ex. 326, SET-2, Part II, at 12-18.
[212] Ex. 326, SET-2, Part I, at 47.
[213] US WEST Brief, at 91.
[214] MCI and AT&T Brief, at 114-115.

space. The process for connecting at the SPOT frame is cumbersome and wasteful. There is no disconnect process in place. US WEST's OSS would require modifications that are not yet defined. Service to integrated digital loop carrier (IDLC) customers could be impaired. Lack of security will cause customer reluctance to choose CLEC service. The potential for delays in order service processing is created. Unnecessary trunking buildout could be required of CLECs.

205. DPS asserts that the use of a SPOT frame will change the nature of the services obtained by CLECs from POTS to a designed service, thereby increasing costs to CLECs and delay in starting service to consumers.[215] Further, DPS asserts that the differences in service resulting from the use of SPOT frames constitutes discrimination prohibited by the 1996 Act.[216]

206. US WEST cites ***Iowa Utilities Board v. FCC***, 120 F.3d 753 (8th Cir. 1997), for the proposition that an ILEC's obligation to provide "nondiscriminatory" access "merely prevents an incumbent from arbitrarily treating some of its competing carriers differently than other; it does not mandate that incumbent LECs cater to every desire of every requesting carrier."[217] US WEST concludes from this language that US WEST "is not required to provide access that is in all respects equal to what it provides itself."[218]

207. US WEST's interpretation of the holding in ***Iowa Utilities Board*** is contrary to the language cited by US WEST from the 1996 Act.[219] The issue being decided in the ***Iowa Utilities Board*** decision was whether the FCC could require ILECs to provide service superior to service in the existing network. Regarding what access is required by the 1996 Act, the 8th Circuit held:

> While the phrase "at least equal in quality" leaves open the possibility that incumbent LECs may agree to provide interconnection that is superior in quality when the parties are negotiating agreements under the Act, this phrase mandates only that the quality be equal--not superior. In other words, it establishes a floor below which the quality of the interconnection may not go. Because the Commission's rule requires superior quality interconnection when requested, see 47 C.F.R. § 51.305(a)(4), the rule is not supported by the Act's language. **We also agree with the petitioners' view that subsection 251(c)(3) implicitly requires unbundled access only to an incumbent LEC's existing network**--not to a yet unbuilt superior one.[220] ***Iowa Utilities Board v. FCC,*** 120 F.3d, at 812-13 (emphasis added).

Many of US WEST's arguments are based on the premise that ILECs are not obligated to provide unrestricted access to its network elements for the benefit of CLECs. The 8th

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[215] DPS Brief, at 142-143.
[216] DPS Reply, at 21.
[217] US WEST Brief, at 91 (quoting ***Iowa Utilities Board v. FCC***, 120 F.3d, at 813.)
[218] US WEST Brief, at 91.
[219] US WEST Brief ,at 90.
[220] ***Iowa Utilities Board v. FCC,*** 120 F.3d, at 812-13 (emphasis added).

Circuit has interpreted the 1996 Act to require that widespread access be provided. For example, the 8th Circuit stated:

> We have upheld the remaining unbundling rules as reasonable constructions of the Act, because, as we have shown, the Act itself calls for the rapid introduction of competition into local phone markets by requiring incumbent LECs to make their networks available to their competing carriers.[221]

And in another area, the 8th Circuit noted:

> Interconnection and unbundled access are distinct from exchange access because interconnection and unbundled access provide a requesting carrier with a direct hookup to and extensive use of an incumbent LEC's local network that enables a requesting carrier to provide local exchange services, while exchange access is a service that LECs offer to interexchange carriers without providing the interexchange carriers with such direct and pervasive access to the LECs' networks and without enabling the IXCs to provide local telephone service themselves through the use of the LECs' networks.[222]

The language in ***Iowa Utilities Board*** undercuts US WEST's assertion that restricted access is in compliance with the 1996 Act. Using the SPOT frame for interconnection keeps the connections of CLECs at "arm's length" from the MDF. The SPOT frame proposal is not consistent with the "direct hookup to and extensive use of an incumbent LEC's local network" required by the 8th Circuit. The SPOT frame constitutes discriminatory access prohibited by 47 U.S.C.A. § 251(c)(2)(C) of the 1996 Act.

208. If US WEST is correct that CLECs' access to a frame will "compromise the security and integrity" of its network,[223] placing all CLECs on a SPOT frame apart from US WEST's MDF means that US WEST will have a service quality advantage over all CLECs. Where SPOT frame access will be subject to network failures (potentially affecting all CLECs accessing network elements through that SPOT frame), US WEST service will be unaffected. From a consumer's point of view, reliability of service will be a purchasing factor consistently demonstrated by US WEST and not available from CLECs. ***This*** is a competitive advantage that the 1996 Act itself denies to each ILEC by requiring that the quality of service available to CLECs be "at least equal in quality to that provided by the local exchange carrier."[224]

209. In response to MCI and AT&T's assertion that SPOT frames introduce additional points of failure, US WEST maintained that a loop provided to CLECs may have fewer splices than one of US WEST's ***own*** loops connected to the MDF.[225] Also, US WEST

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[221] ***Iowa Utilities Board v. FCC***, 120 F.3d, at 816-17.
[222] ***Iowa Utilities Board v. FCC***, 120 F.3d, at 799 (footnote 20).
[223] US WEST Brief, at 91).
[224] 47 U.S.C.A. § 251(c)(2)(C).
[225] US WEST Brief, at 92.

indicated that there are many "theoretical points of failure in the average loop."[226] While true, these facts are not relevant to the particular likelihood of failure through use of SPOT frames and the impact of such failures on CLECs.

210. Due to the discriminatory access resulting from the use of a SPOT frame, that mechanism cannot be used as the means for interconnecting CLEC facilities to the MDF. The SPOT frame does not comport with the requirement of the 1996 Act that the interconnection must be "at least equal in quality to that provided by the local exchange carrier."[227] To meet the 1996 Act requirement regarding quality, a CLEC must be allowed to connect directly to the MDF. US WEST is free to manage access to the MDF to ensure that service is not adversely affected. But such management must be limited to legitimate security and integrity concerns and cannot be used as a means of impairing the quality of service provided by CLECs.

RECOMBINING OF SERVICES

211. An issue closely related to the means of network access is whether services will be provided as unbundled network services or combined by US WEST. MCI, AT&T and DPS maintain that requiring US WEST to provide bundled services is the most efficient means of delivering those services.[228] US WEST asserts that the only obligation placed upon it by the 1996 Act in this area is the provision of unbundled services.[229] Further, US WEST asserts that providing recombined services on the loop level erodes the distinctions between resale of telephone services and UNE.[230]

212. The SPOT frame proposal was proposed by US WEST to give CLECs a single location, apart from the US WEST network, to perform the recombination of the unbundled elements. US WEST cites ***Iowa Utilities Board v. FCC*** for the proposition that the only obligation on an ILEC is providing unbundled services.[231] MCI, AT&T and DPS maintain that the ***Iowa Utilities Board v. FCC*** decision does not preclude local ***commissions*** from requiring only unbundled services, only that such services are not mandated on a federal level.[232]

213. In ***Iowa Utilities Board v. FCC***, the 8th Circuit held that the 1996 Act did not require recombining of ***services***, even if that method of providing services was more efficient. In arriving at that holding, the Court stated:

> The FCC and its supporting intervenors argue that because the incumbent LECs maintain control over their networks it is necessary to force them to combine the network elements, and they believe that the incumbent LECs would prefer to do the combining themselves to prevent the competing carriers from interfering with their

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[226] US WEST Brief, at 93.
[227] 47 U.S.C.A. § 251(c)(2)(C).
[228] MCI and AT&T Brief, at 115; DPS Reply Brief, at 21.
[229] US WEST Brief, at 93.
[230] US WEST Reply, at 62.
[231] US WEST Brief, at 93.
[232] DPS Reply Brief, at 21; MCI and AT&T Reply Brief, at 137.

networks. Despite the Commission's arguments, the plain meaning of the Act indicates that the requesting carriers will combine the unbundled elements themselves; the Act does not require the incumbent LECs to do all of the work. **Moreover, the fact that the incumbent LECs object to this rule indicates to us that they would rather allow entrants access to their networks than have to rebundle the unbundled elements for them**.[233]

214. As discussed above on the issue of SPOT frames, US WEST would rather not provide any CLEC access to any part of its network nor provide recombined elements to CLECs. The SPOT frame proposal by US WEST was an effort to keep CLECs off of the network while not ***providing*** recombined services. The holding in ***Iowa Utilities Board v. FCC*** may be construed as requiring ILECs to choose between providing network access or recombining services. Since US WEST has expressed an unambiguous desire to keep CLECs off of the network for purposes of recombining network elements in order to preserve the "security and integrity" of the network,[234] US WEST must provide recombined elements to CLECs. This outcome is consistent with the ***Iowa Utilities Board v. FCC*** decision and provides US WEST with the assurance of controlling access to its MDF.

215. The 8th Circuit's language in ***Iowa Utilities Board v. FCC*** suggests that the unbundling/recombining of elements was a burden on the ILEC. The process of unbundling network elements creates an economic cost and the process of recombining network elements creates an economic cost.[235] The imposition of such costs for no reason other than to comply with one reading of the 1996 Act is the equivalent of requiring ***holes*** be dug, only to fill them back in. Such a result is contrary to the legislative intent to foster competition in the local exchange market. Without the intent in the 1996 Act for such activity to occur, there is no reason for ILECs to engage in unbundling, and there is no basis for imposing the cost of that activity on CLECs.

216. US WEST asserts that requiring recombined network elements be made available is contrary to the 1996 Act requirement that resale also be made available. Under this view, the requirement that the purchase of resale services (at wholesale rates) is undercut by selling the same services as recombined services (at cost). DPS maintains that the PUC has authority to order recombining of elements "to promote fair and reasonable local service competition." DPS points out that using the existing combinations is more efficient than using SPOT frames.[236]

217. US WEST cites ***US WEST Communications, Inc. v. AT&T Communications of the Pacific Northwest, Inc.***, No. C97-132OR (consolidated), slip op. at 7 (W.D. Wash. July 21, 1998) as support for its analysis that requiring recombination (or restraining from separation) of elements by ILECs is violative of the 1996 Act.[237] MCI and AT&T cite ***Southwestern Bell Telephone Company v. FCC***, 153 F.3d 597 (8th Cir. 1998) for the

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[233] ***Iowa Utilities Board v. FCC***, 120 F.3d, at 813 (emphasis added).
[234] US WEST Brief, at 91.
[235] Ex. 307 at 7-8.
[236] DPS Reply, at 20-21.
[237] US WEST Reply, at 59.

proposition that the combination of network elements does not violate the 1996 Act.[238] In ***Southwestern Bell***, the FCC's designation of "shared transport" as a single network element that must be made available to CLECs was challenged.[239] The challengers asserted that the FCC had no authority to aggregate the parts that constitute shared transport and require that such an aggregation be made available to CLECs. The 8th Circuit noted that its holding in ***Iowa Utilities Board v. FCC*** was consistent with the FCC's requirement. Regarding the difference between unbundled elements and resale, the 8th Circuit stated:

> Indeed, we believe that our decision in Iowa Utilities Board supports our decision in the case at hand. As discussed *supra* under subheading A, we expressly upheld the FCC's section 251(d)(2) determination that various "functions" should be provided on an unbundled basis, notwithstanding the fact that these functions could also be considered finished services purchasable for resale pursuant to section 251(c)(4). *See* ***Iowa Utils. Bd.***, 120 F.3d at 809 (acknowledging that "a competing carrier may have the option of gaining access to features of an incumbent LEC's network through either unbundling or resale"). If the FCC may require incumbent LECs to provide unbundled access to functions and capabilities which may also be purchasable at retail as "finished services" (e.g., caller I.D., call waiting, call forwarding, operator services, and directory assistance), it certainly may require LECs to provide unbundled access to a separate function or capability such as shared transport which, when combined with other network elements, enables a new entrant to provide local telecommunications service.[240]

218. The 1996 Act sets out the role of local public utilities commissions as follows:

> (3) Preservation of State access regulations
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> In prescribing and enforcing regulations to implement the requirements of this section, the Commission shall not preclude the enforcement of any regulation, order, or policy of a State commission that -
>
> > (A) establishes access and interconnection obligations of local exchange carriers;
> >
> > (B) is consistent with the requirements of this section; and
> >
> > (C) does not substantially prevent implementation of the requirements of this section and the purposes of this part.[241]

219. In this matter, the recombining of network elements constitutes a lesser burden on ILECs and provides greater efficiency and lower costs for CLECs. Recombining also

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[238] MCI and AT&T Reply Brief, at 157-158.
[239] ***Southwestern Bell Telephone Company v. FCC***, 153 F.3d 597 (8th Cir. 1998).
[240] ***Southwestern Bell***, 153 F.3d, at 606.
[241] 47 USC § 251(d)(3).

protects networks from service interruptions created by unnecessary work on the MDF. Under 47 USC § 251(d)(3), the Commission has the authority to determine the access and interconnection requirements for ILECs and CLECs. That authority must be consistent with the provisions of the 1996 Act and must not substantially prevent implementation of the 1996 Act and its purposes.

220. MCI, AT&T and DPS maintain that requiring recombination is consistent with the Commission's authority. US WEST's assertion that recombining is the same as resale, at lower cost, is an assertion that recombining network elements undermines the 1996 Act.

221. In ***Southwestern Bell***, the 8th Circuit expressly addressed the argument that resale is undermined by ***recombining*** of network elements, as follows:

> Where, as it has here in § 251(d)(2), Congress expressly delegates to an agency the power to formulate policy and fill gaps in a statutory scheme, we defer to agency regulations promulgated pursuant to such delegation "unless they are arbitrary, capricious, or manifestly contrary to the statute." ***Chevron***, 467 U.S. at 843. Here, Congress limited the FCC's authority only by directing it to consider "at a minimum" the two above-described factors, and petitioners do not argue that the FCC failed to give adequate consideration to either one. 47 U.S.C.A. § 251(d)(2). In fact, petitioners do not assert that the FCC violated the express language of section 251(d)(2) or any other provision of the Act. Rather, petitioners argue that the FCC's decision that incumbent LECs must provide shared transport on an unbundled basis is inconsistent with Congress's overarching intention of maintaining a meaningful distinction between unbundled access to network elements and resale.
>
> The distinction between unbundled access and resale is important, petitioners argue, because sections 251(c)(3) and 252(d)(1) require incumbent LECs to provide unbundled access at cost-based rates, while sections 251(c)(4) and 252(d)(3) allow incumbent LECs to provide retail services for resale at a higher price, equal to the LEC's retail subscriber rates less avoided costs. Petitioners argue that, if use of all of an incumbent LEC's shared transport facilities may be collectively purchased on a per-minute-of-use basis, entrants will effectively be able to purchase preassembled platforms for resale at the lower cost- based price reserved for unbundled access to network elements. Petitioners argue that if this is allowed to occur, the distinction between resale and unbundled access will be obliterated.
>
> This argument is predicated on petitioners' speculative assumption that shared transport will be priced on a usage-sensitive basis. Because the pricing scheme for shared transport (and all other unbundled elements) will be determined by the state commissions, see 47 U.S.C.A. § 252(c)(2); ***Iowa Utils. Bd.***, 120 F.3d at 818, it is impossible for this court to determine at this time whether shared transport will be priced in such a way as to erode the distinction between resale and unbundled access. Since, as in ***Iowa Utilities Board***, "we do not know what the state-determined rates [or even what the rate structure] will be," it follows that petitioners' arguments regarding the actual costs that entrants will incur are "speculative at

> best." 120 F.3d at 816. Until the state commissions exercise their authority to determine how shared transport will be priced (i.e., whether on a flat, use-sensitive, or other basis, and at what price), we could do no more than conjecture as to whether the unbundled sale of shared transport will erode the careful distinction between resale and unbundled access. Accordingly, we decline at this time to consider petitioners' argument to this effect. There will be time enough to do so once a state commission has compiled a record, applied its expert analysis, and rendered a decision, and an appeal has been taken to a federal district court pursuant to § 252(e)(6).[242]

222. Thus, the mere fact that recombined services are available to providers on a resale basis does not preclude requiring recombining of those services as part of the interconnection ***standards*** to be set by the Commission. The distinction between recombining and resale is, under ***Southwestern Bell***, determined by pricing, not by the similarities of the services obtained.

223. MCI and AT&T point out that CLECs are obligated to: 1) establish points of connection for local exchange traffic; 2) establish reciprocal compensation arrangements with carriers in the geographic area; 3) establish access service for interexchange carriers (IXCs); 4) establish 911/Operator Service for customers; 5) engineer the network created from UNEs and other interconnections to ensure sufficient facilities and transport capacity; 6) establish (to the extent desired) different capacities than the ILEC's service; 7) integrate CLEC facilities with leased or purchased ILEC elements; and 9) establish billing systems.[243] Under resale, these requirements are either included in the ILEC service purchased for resale or not required for engaging in the resale of telephone service.

224. The ALJ concludes that imposing an unbundle/***recombine*** requirement on UNEs is to "substantially prevent implementation" of local competition provisions of the 1996 Act in violation of 47 USC § 251(d)(3)(C). US WEST's proposal to unbundle combined network elements solely to burden CLECs with the need to rebundle those elements violates the 1996 Act. US WEST must provide UNEs in combination as requested by CLECs and, if necessary, recombine them on behalf of CLECs.

COLLOCATION

225. Collocation is the practice of placing equipment belonging to a CLEC in close proximity to ILEC equipment for the purpose of interconnecting each provider's system. The direct connection between the CLECs and US WEST can be managed through physical collocation or virtual collocation, which are discussed below. Physical collocation will require interaction with CLEC and US WEST technicians at the MDF with each party working on its own equipment at the MDF. Virtual collocation will place that burden solely

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[242] ***Southwestern Bell,*** 153 F.3d, at 604-605.
[243] Ex. 307, at 5-7.

on US WEST, since the title to the equipment (and the obligation for its maintenance) will vest with US WEST.[244]

226. In the case of physical collocation, the CLEC rents space at an ILEC facility, the CLEC pays the ILEC for any resources used (such as electricity and cooling) and the CLEC is responsible for maintenance of its own equipment. In virtual collocation, the CLEC purchases the same equipment, but the title is transferred to the ILEC (typically with the CLEC retaining the right to repurchase the equipment). The impact of the transfer is to place maintenance responsibility with the ILEC, paid for by the CLEC, and to restrict the access of CLEC staff to the equipment.[245]

227. Generally speaking, US WEST proposes that collocation costs be determined by their Total Element Long Run Incremental Costs (TELRIC).[246] US WEST suggested three categories for such costs, costs common to both physical collocation and virtual collocation, costs unique to physical collocation, and costs unique to virtual collocation. The rate design advanced by US WEST uses the TELRIC for the option chosen plus an allocation of common costs.[247]

228. MCI and AT&T assert that both physical and virtual collocation costs should be established by TELRIC. For physical collocation the TELRIC would be the cost of central office space and the connection to US WEST's equipment. For virtual collocation, the TELRIC for the equipment maintained on behalf of each CLEC would be the appropriate cost.[248]

229. If the distance from the MDF to the collocation point is too long, additional equipment is necessary to strengthen the signal. US WEST includes the cost of regeneration as both a recurring cost and, where required, a nonrecurring cost.[249] A later estimation of costs included a recurring charge of $27.61 per manhole and $15.22 per handhold under the category of "Entrance Enclosure".[250] The schematics sponsored by MCI and AT&T for CLEC interconnection show a manhole providing access to the route for cable to enter the central office.[251]

230. A Collocation Cost Model (CCM) is proposed by MCI and AT&T to arrive at standard cable lengths incurred by an ILEC when virtual collocation is made at a site. MCI and AT&T assert that the imposition of standard cable lengths prevents ILECs from manipulating costs by placing collocation equipment at a distance from the interconnection.[252] Other costs cited by MCI and AT&T as manipulated by ILECs include "demolishing existing walls, removing doors, electrical and mechanical components, . . .

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[244] Ex. 325, at 4.
[245] Ex. 196, at 10; Ex. 325, at 4-5.
[246] Ex. 233 at 30.
[247] Ex. 233 at 30; Ex. 241.
[248] Ex. 341 at 11-12.
[249] Ex. 241.
[250] Ex. 248, U S West Interconnection Price List, at 4.
[251] Ex. 326, SET-2, Part I, at 3 (Figure 1A).
[252] Ex. 325 at 8.

new corridors, hallways, doors, and sometimes even a costly new external entrance to the building, allegedly to provide a 'secure environment.'"[253] The CCM incorporates maintenance and security costs for service and further breaks those costs out by type of facility where the interconnection occurs.[254] The CCM White Paper describes the access process as follows:

> The collocation of competitive equipment in ILEC central office buildings includes fiber connectivity between the first manhole and the CLEC collocation area, using CLEC-provided, fire-retardant cable for routing cables through the CO [ILEC Central Office]. Ideally, the pulling and splicing of fiber cable between the manhole and the cable vault, and the subsequent routing of fiber riser cable between the cable vault and collocation area, would be performed by the CLEC. In the event that this is not permitted, however, the CO model layout incorporates assumptions (which are outlined below) to calculate the costs that an efficient ILEC would incur to perform these functions in a competitive environment.[255]

231. US WEST includes a recurring cost for a manhole or handhold premised on the assumption that such an access point will be needed outside the CO for passing CLEC fiber into the building. The assumption in the CCM is that the CLEC fiber will parallel ILEC fiber (running toward the central office) from the location of the first existing access point.[256] The MCI and AT&T schematic shows such a facility as needed for interconnection. An ILEC is entitled to reimbursement for the use of the manhole or handhold by the CLEC. Proposing the reimbursement as a collocation cost is appropriate only where the cost is not being paid to the ILEC from another source. Both the HAI and BCPM models include "underground structure" costs that include manholes and handholds.[257] The cost of these structures is included in the cost of the loop being charged to CLEC. The cost of the manhole or handhold must be excluded altogether from either recurring or nonrecurring costs of collocation because to do otherwise would result in the ILEC being compensated twice for the use of the same asset.

232. US WEST identifies floor space, enclosure, building entrance facilities, security, cable and cross connect terminations (for SPOT frames), power, and grounding as network components for physical collocation. The only differences for virtual collocation are the lack of an enclosure[258] and the need for escorts to meet ILEC security requirements when CLEC staff come onsite.[259] US WEST maintains that the building entrance facilities are a special construction that should be recovered on a nonrecurring charge. Card scanners are proposed by US WEST as an appropriate charge for security.[260]

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[253] Ex. 326, SET-2, Part I, at 53.
[254] Ex. 325 at 11.
[255] Ex. 326, SET-2, Part I, at 43.
[256] Ex. 196.
[257] Tr. Vol. 5b at 5; Tr. Vol. 10 at 215.
[258] Ex. 196 at 15.
[259] Ex. 326, SET-2, Part II, at 27.
[260] Ex. 196 at 19-20.

233. MCI and AT&T propose the use of the physical collocation rate design prepared for, but not adopted by, the Oregon Public Utilities Commission (Oregon PUC).[261] US WEST asserts that its collocation model is needed to recover costs that have been identified through their experience in delivering local telephone service in Minnesota.[262] The US WEST model would recover costs that have been incurred in the past, but are not incurred through the use of forward-looking technology. These embedded costs are the principle point of contention between the cost models advanced by the parties.

234. US WEST proposes to break out the costs of collocation into both recurring and nonrecurring costs. The Physical and Virtual Collocation Recurring and Nonrecurring Cost Study (US WEST collocation study) identifies specific items that may be included in the collocation process, sets a price for those items, and charges out those items as used. The use of an "individual case basis" (IBC) approach encourages manipulation of collocating equipment to maximize the cost to competitors and thereby reduce the ability of CLECs to enter the local exchange market. US WEST criticizes the CCM cost model as unsuitable for "25 of the 26 central offices that were most likely to experience collocation demands in the Minneapolis-St. Paul area."[263] This criticism is made without adequate investigation of the actual CO conditions (floor plans were relied upon).[264]

235. US WEST's approach demonstrates too narrow a focus in the proper calculation of collocation costs. The introduction of competition, while sure to occur first in the higher density areas, will not be limited to those areas. As the competitive local market matures, collocation will expand beyond the urban areas described by US WEST. Using the MCI and AT&T collocation model removes the ability of an ILEC to manipulate costs as a barrier to entry. Since US WEST will be able to exercise discretion in assigning collocation facilities, US WEST will be able to avoid undue costs.

236. Moving local telephone service into a competitive market creates the expectation that processes will change to reflect the need for efficiency. Building costs into the collocation rate that are based on inefficient processes raise barriers to entry into local competition for CLECs and reduce the incentive to update processes for ILECs. Since the movement of customers will, over time, go between CLECs and ILECs, there is a need for forward-looking service methods to be favored over embedded costs. US WEST's incorporation of embedded costs in its collocation model does not afford any reasonable measurement of costs in a competitive market.

237. MCI and AT&T assert that their collocation model is conservative, that is, the costs it calculates are actually higher than the actual costs an ILEC will incur over the life of the model.[265] Examples of the costs assumed for all COs are a three-floor design (increasing

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[261] Ex. 341 at 12.
[262] US WEST Reply Brief, at 53-54.
[263] US WEST Brief at 67.
[264] MCI and AT&T Reply, at 113-115.
[265] MCI and AT&T Brief, at 100.

cable length costs), larger power reserve, and costs for power available, rather than actually used.[266]

238. US WEST objected to the CCM as having cost items that are unrealistic. Unavailability and cost of space, location of power supply, number of collocation bays sited to share expenses, and need for additional facilities, such as manholes, are identified as flaws in CCM.[267] The manhole objection is discussed above. The other cost items are appropriately included in the methodology of the MCI and AT&T collocation model to prevent manipulation of the collocation process to increase costs for CLECs. Some adjustments to the CCM are needed to more closely reflect actual conditions in collocating equipment. The US WEST collocation study overemphasizes worst case conditions and should not be used for calculating collocation costs.

239. The assumed cost of land ($20.00 per square foot) for calculating the facility cost in the CCM is criticized by US WEST as unrealistic. Using the default land cost in the CCM, the cost of land for a 30,000 square foot building is $600,000.[268] Despite its criticism, there was no alternative figure proposed by US WEST to calculate the cost of land. US WEST did propose a monthly rental charge of $6.24 per foot.[269] CCM uses a building cost calculation to arrive at a land plus building cost of $164.38 per assignable square foot.[270] The rental cost derived from that cost is $3.92 per square foot.[271] Without a breakout of the data used by US WEST to calculate its rental charge, there is no basis for preferring US WEST's higher monthly charge to the lower charge proposed in the CCM. MCI and AT&T have demonstrated that the facility cost calculation in the CCM is appropriate.

240. MCI and AT&T maintain that the cost of card readers is included in the rental charge for the portion of the building used for collocating equipment.[272] US WEST asserts that card readers are not currently installed in many COs.[273] MCI and AT&T acknowledged that card readers are not standard security devices and proposed modifying the space rental charge to account for the cost of installing those devices. The cost of such devices is not substantial and can be meaningfully recovered by an ILEC through an adjustment to the facility cost.

241. Cable costs are determined in large measure by the distance collocated CLEC equipment is placed from ILEC equipment. The CCM proposed by MCI and AT&T calculates an average of the minimum distance reasonably achievable and a "worst case scenario" of a three-floor model of a downtown CO.[274] US WEST asserts that five floors

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[266] *Id.*
[267] US WEST Brief, at 71.
[268] Ex. 326 at BU #18.
[269] Ex. 253, Ex. H, at 3).
[270] Ex. 326 at BU #18.
[271] MCI and AT&T Reply Brief, at 116.
[272] Ex. 326 at 55.
[273] US WEST Brief, at 72-73.
[274] Ex. 326, SET-2, Part I, at 18.

are needed at its downtown Saint Paul CO.[275] For outlying COs, a one- or two-floor design is the norm. Additional costs that will be paid by CLECs collocating equipment at outlying COs as the competitive market matures will offset any potential undercompensation to the ILEC in a single, urban CO. Additionally, the control exercised by the ILEC in siting the collocation equipment encourages the ILEC to adopt the most efficient system possible, rather than keeping in-place outdated equipment or administrative space.[276]

242. US WEST maintains that the CCM calculation is an effort to exclude urban COs from the calculation of cable costs. The methodology used in the CCM averaged the minimum required length with the "worst case scenario", with no other factors included.[277] The methodology does not weight the calculation against urban COs. The three-floor model (worst case scenario) used in the CCM anticipates location of the collocating equipment two floors and at opposite corners from the ILEC equipment.[278] The distance calculated in the three-floor model in the CCM may actually be longer than the distance required in a five-floor CO, should the collocating equipment be situated directly above or below the ILEC equipment.[279] With the potential for collocating equipment in spaces smaller than the assumed four 100 square-foot bay configuration, MCI and AT&T have demonstrated that the CCM does not understate cable costs.[280]

243. MCI and AT&T maintain that the CCM describes the collocation costs for power conservatively (*i.e.* overstating the actual cost), by calculating costs by the power delivered to CLEC equipment rather than power actually consumed. US WEST maintains that the potential for locating collocated equipment far from power sources imposes a cost not recognized in the CCM. The CCM anticipates the fuse bay of the electrical power supply will be located within 35 feet of the collocated equipment of four 100 square foot CLEC bays.[281] US West correctly asserts that the CCM assumes that sufficient space is available for collocation of CLEC equipment because it can be sited in smaller configurations apart from the ILEC equipment.[282] However, the four bay configuration is merely an assumption for calculating costs, not a prediction of actual construction conditions to be encountered when physical collocation is requested in any particular CO. By setting the sharing factor for fuse bays at four 100 square foot collocation bays, US West is encouraged to make the changes in its existing equipment configurations and usage of space to reduce collocation costs. The imposition of higher costs on CLECs for power is inappropriate as it encourages inefficient siting decisions. US West has made no showing that undercompensation is likely to occur through modeling based on efficient siting configurations. In many COs, there will be no difficulty in finding adequate space for the

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[275] US WEST Reply, at 56.
[276] Tr. Vol. 7 at 24-25.
[277] Tr. Vol. 7 at 62-63.
[278] Ex. 326 at 17.
[279] *See,* Ex. 326 at 18 (cable drops of 20 feet per floor would amount to less than the 220 feet of distance assumed for traversing the CO); MCI and AT&T Brief, at 101.
[280] Ex. 326, SET-2, Part 1, at 13.
[281] Ex. 326, SET-II, at 34 (figure 5c).
[282] Ex. 326, SET-2, Part 1, at 13.

collocation configuration assumed in the CCM. The financial incentives remain for ILECs to situate such equipment close to power supplies.

244. The CCM assumes that the cost of grounding will be shared between four 100 square foot CLEC collocation facilities.[283] As discussed above, the CCM appropriately assumes sharing the cost of power connection between four 100 square foot CLEC collocation facilities. The cost of grounding equipment is appropriately shared in the CCM. Similarly, costs for holes and racking are also appropriately assessed in the CCM.

245. US WEST argues that the cost of regenerating signals for distances over 450 feet for DS3 circuits and 655 feet for a DS1 circuit should be included in collocation cost charged to CLECs.[284] Since ILECs control the location of the collocating equipment and such equipment can be placed to maximize the cost to competitors, some incentive must be built into the cost model to promote the most efficient placement of equipment in the CO. The distances to be traversed by these circuits, occurring within a building, are substantial before this cost would be incurred. US WEST is in complete control of all its COs. US WEST introduced no evidence of any existing CO that would require this equipment to be installed. US WEST's burden is not met by suggesting that collocation over these distances might be required. Given the ability to place equipment in smaller configurations on different floors in a multi-floor CO, regeneration is unlikely to be required and the cost of regeneration is appropriately excluded from the costs to be paid by CLECs.

246. The CCM includes an occupancy factor of 75 percent to compensate an ILEC for collocation space built and not occupied. The assumption behind the factor is that collocation space built for a CLEC would be fully occupied for the first several years after the equipment was installed, then have a much lower rate of occupancy for the remaining decades of the life of the equipment.[285] The assessment by MCI and ATT as to the likelihood of unoccupied space (under the CCM) is rather speculative. But the space need not be occupied by collocators to be put to gainful use.[286] With the tendency to overload cable racks, ILECs that have efficiently sited collocation facilities close to their own equipment will be able to use the facilities for ILEC equipment.[287] No alternative occupancy factor has been proposed for use in the CCM. The occupancy factor proposed for the CCM, 75 percent, is sufficient to protect the property interests of ILECs.

247. The overhead factor proposed by MCI and AT&T in the NRCM is 10.4 percent. The CCM should be modified to use the 13.09 percent figure used for UNE costs as the appropriate overhead percentage for nonrecurring costs. With that modification, the ALJ recommends that the CCM be used for estimating collocation costs.

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[283] Ex. 326, SET-2, Part 1, at 63.
[284] US WEST Brief, at 71; Tr. Vol. 7 at 30.
[285] Tr. Vol. 9 at 9.
[286] Tr. Vol. 9 at 12.
[287] Tr. Vol. 7 at 82.

NONRECURRING COSTS

248. The costs incurred to provide ongoing services are reflected in recurring charges. Such charges recover the costs associated with the service at the same time the costs are incurred. Nonrecurring charges recover the costs associated with the establishment of a service. Usually, such charges are one-time costs and are related to the work required to initially connect the customer. Costs arising from capital investment must be recovered as recurring costs to accurately reflect the manner in which the expense is incurred. Imposing a nonrecurring charge to recover recurring costs distorts the costs of entry into local markets. Such distortions constitute a barrier to entry by competitors to the ILEC.[288]

249. An accurate and reliable nonrecurring cost study must include all activities associated with the establishment of service. Once identified, the time that must be expended to perform each task is measured and the probability that it will be performed upon a request for service is assessed. Multiplying the time required to perform an activity by the probability and by the appropriate labor rate results in the cost of each activity. The nonrecurring charge is the sum of the cost for the applicable activities. The modeling advanced by MCI and AT&T and by US WEST all use this methodology to arrive at the costs they advocate.[289]

Operational Support Systems Interfaces

250. MCI and AT&T maintain that nonrecurring costs for the provisioning of services to new or transferring customers should be minimal due to the increasing reliance upon electronic methods controlled by computer.[290] These methods, know as Operational Support Systems (OSS), eliminate manual intervention for all orders that are successfully completed by computer (known as "flow through"). Orders that are not successfully completed by computer (known as "fallout") are completed by service personnel, requiring more time before the service is available to the customer and imposing higher cost on the service provider.[291]

251. MCI and AT&T claim that two Regional Bell Operating Companies (RBOCs) are currently using OSS with a fallout rate as low as 1 percent.[292] The experience of NYNEX (an RBOC) in proposing the reduction of NRCs for rates for changes to customer service to $1, is cited by MCI and AT&T as the impact of an efficient OSS on NRCs.[293]

252. MCI and AT&T recognize that fallout is inevitable and manual intervention must be provided for in the NRC for customer services changes. US WEST's proposed NRC for such intervention is criticized by MCI and AT&T as treating every instance of fallout as requiring the same degree of intervention and allowing for no economies of scale. MCI and AT&T asserts that orders will be placed in "batches" and fallout will result in multiple

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[288] *See,* First Interconnection Order, §§ 745-747; Ex. 615 at 26.
[289] Ex. 615 at 26.
[290] Ex. 335 at 5.
[291] Ex. 335 at 7.
[292] Ex. 335 at 8.
[293] Ex. 335 at 5.

orders being manually processed, thus reducing costs incurred by the ILEC to perform such work.[294] Further reduction in full-cost manual intervention can be achieved through the use of additional software that detects fallout and provides a troubleshooting report that, in some instances, can remove any need for a service trip.[295]

253. The fallout rate assumed by MCI and AT&T in their Nonrecurring Cost Model (NRCM) is two percent. The lower fallout rate is based on MCI and AT&T 's assumption that forward-looking and efficiently managed systems will incur lower costs.[296] MCI and AT&T indicate that the low fallout rate depends upon the use of local digital switches, integrated digital loop carriers, digital cross-connect systems, and Synchronous Optical Network (SONET) rings.[297] US WEST points out that approximately 28 percent of its network, mostly in rural areas, is not equipped to conduct OSS on an automated basis.[298] It bears noting that, in its collocation arguments, US WEST indicates that these areas are not likely to be the subject of competition.[299]

254. The OSS interface proposed by US WEST consists of three parts. The Interconnect Mediated Access system (IMA) is a web-based interface that takes the customer information entered by CLEC personnel and presents that information to a US WEST service representative.[300] The service representative reviews the information and enters the information into the US WEST computer. The order will then be processed by computer or manually, depending upon the particular service requested and US WEST's OSS capabilities.

255. The second part of the OSS interface proposed by U S WEST is the Electronic Data Interchange (EDI) based system, which is a computer-to-computer system rather than a human-to-computer system utilized by the IMA. All CLEC orders processed through the EDI interface are required to be reviewed by a U S WEST representative or retyped into the U S West system in the same manner as are orders processed using IMA.[301] As currently used, EDI is at present only available for POTS resale orders and two preorder transactions.[302] The third part of the OSS interface is Electronic Bonding Trouble Administration (EBTA), which works with EDI to access repair functions.[303] IMA and EDI are the parts of the OSS at issue in this proceeding.

256. US WEST described the IMA as "substantially the same as US WEST's service representatives enjoy." The IMA, according to US WEST, provides for "flow-through" and does not require double entry of information if "screen scraping" is used.[304] MCI, AT&T

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[294] Ex. 335 at 11-12.
[295] Ex. 335 at 17.
[296] Ex. 335 at 14.
[297] Ex. 335 at 15.
[298] US WEST Brief, at 85.
[299] US WEST Brief, at 67.
[300] Ex. 615 at 16.
[301] Ex. 619 at 9.
[302] Tr. Vol. 10 at 105-7.
[303] US WEST Reply Brief, at 32.
[304] US WEST Reply Brief, at 31-32.

and DPS dispute this characterization, pointing out that manual intervention is required for any CLEC order, whereas US WEST orders are directly input into the computer.[305] No CLEC order is provided immediate feedback as to acknowledgement, success, or failure.[306] IMA, in MCI and AT&T 's opinion, does not meet industry standards for interfaces, because only computer-to-computer interfaces are sufficient to meet those standards.[307]

257. In the implementation of the OSS process, US WEST intends to stop any order placed through the EDI to allow US WEST personnel to examine the order.[308] DPS maintains that such intervention raises costs.[309] US WEST maintains that this practice is required for "catching order errors before CLEC orders are submitted to U S West's OSS."[310] US WEST maintains that IMA meets national standards by using hypertext markup language (HTML) and transmission control protocol/internet protocol (TCP/IP).[311]

258. US WEST's assertion that the IMA does not require entering information twice is incorrect.[312] US WEST's own description of the IMA system makes clear that CLECs are placed in the same position as a retail customer calling for service.[313] The obligation to provide a forward-looking and efficiently managed access to OSS is not met by, in essence, opening the retail order system to CLECs.

259. US WEST argues that MCI and AT&T have "absolutely no legal basis" for claiming that requiring a US WEST service representative be involved "in reviewing CLEC orders" is discriminatory.[314] The issue is not a question of law, but of fact. Customers calling US WEST for new or altered service deal with a single person over the telephone. The single US WEST service representative makes, in most cases, real time changes to the customer's service. The proper codes for assigning services are available in English rather than Universal Service Order Code.[315] By contrast, the IMA method for CLECs requires that a customer call a CLEC service representative who submits a change order to US WEST. No confirmation is received by the CLEC that the order was received by US WEST, so the customer cannot be assured that the order was received. At some unspecified time later, a US WEST representative reviews the change order and enters the request into the US WEST OSS. If any problems occur at that point, the US WEST representative would have to contact the CLEC service representative to report the problem or clarify what services were requested.[316] The "mediated" portion of IMA has no

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[305] MCI and AT&T Reply Brief, at 86; DPS Reply Brief, at 19.
[306] MCI and AT&T Reply Brief, at 86.
[307] *Id.*
[308] Ex. 220 at 19 ("processed through a set of business rules"); Tr. Vol. 10 at 72.
[309] Ex. 616 at 13.
[310] US WEST Reply Brief, at 33.
[311] Ex. 222 at 13-14.
[312] Ex. 220 at 29; Ex. 222 at 11-12.
[313] Ex. 220 at 19 (computer-to-computer shown as a "future interface" and subject to review for business processes); Ex. 222 at 11-12.
[314] US WEST Reply Brief, at 32.
[315] Ex. 615 at 13-14.
[316] *See* Ex. 223 at 6-7 (manual processing needed due to errors and edits).

counterpart in US WEST's own customer service system and constitutes discriminatory access to US WEST's OSS.

260. US WEST's stated reason for requiring 100 percent fallout, checking to prevent ordering errors, is not supported in the record of this proceeding. Transfers of customers without any alteration of vertical features are unlikely to have errors. No mechanism is identified for correcting errors where an incorrect vertical feature is mistakenly selected. Where errors occur that prevent mechanized transfer, the system itself generates the fallout of the order and initiates human intervention.

261. US WEST maintains the ***Iowa Utilities Board*** decision holds that ILECs need not "cater to the desires of requesting carriers."[317] As discussed above, that language was directed toward compelling quality for CLECs superior to that the ILEC provides for itself. Here the equating of quality for access to the US WEST OSS requires that CLEC customer representatives enter data into a computer system that treats the data in the same fashion with the same number of steps that US WEST service representatives must follow. Requiring that CLECs use a system requiring 100 percent fallout is, by definition, discriminatory. Requiring that CLECs receive identical access to US WEST's OSS is meeting the requirements of the 1996 Act, not catering to a CLEC's desires.

262. DPS points out that IMA was rejected for interim use as an OSS interface by the Commission in two recent arbitrations.[318] The Commission expressly found that IMA was not consistent with "the national standards that are taking shape and not at parity with its own internal interfaces."[319] US WEST maintains that IMA meets national standards.

263. The national standards that the US WEST OSS interface is asserted to meet are not for OSS systems. HTML and TCP/IP (the other cited national standards) are the fundamental standards for utilizing any web-based application, not real-time database connectivity. To achieve database connectivity meeting national standards for OSS, the web application must be able to input required information into the database without intervention by a US WEST representative and receive immediate confirmation that the information was received and the status of the change order.[320] The methodology proposed by US WEST demonstrates that IMA and EDI do not use available means of providing nondiscriminatory access to US WEST's OSS.

264. The FCC has ordered US WEST to develop a nondiscriminatory interface to its OSS and make it available by January 1, 1997.[321] The type of interface that would meet the requirements of the Order was expressly described as follows:

> 523. We thus conclude that an incumbent LEC must provide nondiscriminatory access to their operations support systems functions for pre-ordering, ordering,

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[317] US WEST Reply Brief, at 35 (quoting ***Iowa Utilities Board***, 120 F.3d at 813).
[318] Ex. 615 at 4 (citing Consolidated Arbitration, Docket Nos. P442, 421/M-96-855, P5321, 421/M-96-909, and Docket No. P3167, 421/M-96-729, and ATT and GTE arbitration, Docket No. P442, 407/M-96-939).
[319] Ex. 615 at 4-5 (quoting Docket Nos. P442, 421/M-96-855, Order Resolving Arbitration Issues, at 37 (December 2, 1996)).
[320] Ex. 223 at 4-6.
[321] First Interconnection Order, ¶ 525.

> provisioning, maintenance and repair, and billing available to the LEC itself. Such nondiscriminatory access necessarily includes access to the functionality of any internal gateway systems the incumbent employs in performing the above functions for its own customers. **For example, to the extent that customer service representatives of the incumbent have access to available telephone numbers or service interval information during customer contacts, the incumbent must provide the same access to competing providers. Obviously, an incumbent that provisions network resources electronically does not discharge its obligation under section 251(c)(3) by offering competing providers access that involves human intervention, such as facsimile-based ordering**. [322]

265. The "human intervention" required by the IMA interface does not meet the standard expressly set for OSS interconnection. US WEST cannot benefit from having failed to comply with the FCC Order. US WEST cannot impose a cost on CLECs for developing a method of discriminatory access to its OSS. CLECs are entitled to a rate determined through forward-looking and efficient systems. Other RBOCs have achieved integration with their OSS systems for resale (with fallout rates approaching 99 percent for typical residential service) and have proposed rates accordingly.[323]

266. U S WEST has developed the EDI interface to meet national standards, but it does not do so. As noted above, all orders processed through the EDI interface must still be reviewed by a U S WEST representative or retyped into U S WEST's LEGACY system in the same manner as are orders processed using IMA and is presently only available for POTS resale orders and two preorder transactions. Clearly, EDI is deficient in providing non-discriminatory access to CLECs.

267. Because the systems fail to provide non-discriminatory access, the "start-up recovery cost" of $4.1409 per order proposed by US WEST is inappropriate and cannot be imposed. Similarly, the $0.6396 per order charge proposed for the operation and maintenance cost recovery for electronic data interfaces cannot be charged, since the charge is for a system that does not meet the applicable standard. Because the charge cannot be imposed, there is no reason to impose a "true-up" of the charge as proposed by US WEST.

268. The ALJ recommends that U S WEST be denied recovery of any costs associated with the development of its OSS interfaces until the Company makes a showing that the interface provides non-discriminatory access as required by Section 251(c)(3) of the 1996 Act and until the Company provides reliable cost support for its proposed rates. If U S WEST makes such a showing, the Commission should order cost recovery using the same methodology it approved in the Consolidated Arbitration.

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[322] FCC First Interconnection Order, 96-325 (August 28, 1996), ¶ 525 (footnotes omitted, emphasis added).
[323] Ex. 223 at 4.

U S WEST's Non-Recurring Cost Studies

269. U S WEST's non-recurring cost studies implicitly assume that its existing business processes are efficient and cost-effective and therefore forward-looking.[324] U S WEST's non-recurring cost study methodology also assumes all unbundled loop orders will be designed circuits rather than POTS services. A designed circuit requires more human intervention and time for provisioning than does POTS service.[325] In addition to these issues, Department witness Susan Pierce found several other flaws in the studies including outdated time studies, improper fallout rates, duplicative processes, and the like.[326]

270. US WEST has proposed a customer transfer charge (CTC) as a nonrecurring cost that would be imposed whenever a retail customer account is transferred.[327] Depending on the type of customer and the line involved, the CTC would range between $11.16 to $22.05.[328] DPS objected to the inclusion of the CTC as an inappropriate recovery of costs as nonrecurring.[329] As DPS pointed out, most of the cost of the CTC for residence-mechanized customer transfer charge for first lines was for OSS development costs.[330] MCI and AT&T have suggested the appropriate level of customer transfer charge as $1.69 for manual service required for order processing.[331] MCI and AT&T suggest that CLECs and ILECs pay their own cost for OSS gateway development.[332]

271. In a competitive environment, customers will change back and forth among all the providers in a service area, including the ILEC. An efficient OSS benefits every provider in the service area by facilitating customer choice and eliminating barriers to efficient initiation of service. An inappropriately high customer transfer charge may encourage "churn" of customers to impose costs on CLECs not borne by the ILEC. Including OSS development costs in the CTC charged only to CLECs is inappropriate. OSS development costs must be measured across all providers, including the ILEC. The time over which the costs should be calculated is the anticipated life of the OSS.[333] Measured in that fashion, the CTC should include the costs of development of a nondiscriminatory OSS. At this point in time, such an OSS does not exist.

272. U S WEST's non-recurring installation charge includes the cost of disconnection. MCI and AT&T assert that an ILEC should only be compensated for disconnection when disconnection actually occurs because ILECs have developed efficient processes for handling disconnection orders without performing any manual action.[334] The Department

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[324] Ex. 615 at 29.
[325] *Id.* at 33-34.
[326] *Id.* at 33-35.
[327] US WEST Brief, at 58.
[328] US WEST Brief, at 65.
[329] Ex. 615 at 18.
[330] Ex. 615 at 19.
[331] Ex. 341 at 36.
[332] Ex. 341 at 30.
[333] Ex. 615 at 23.
[334] Exs. 308 at 6 and 335, at 23-24.

agrees.[335] In such an instance, an electronic order disconnecting the service is placed through the ILEC OSS and the service is terminated to the customer.[336] This process is a logical, rather than physical disconnection.[337] Approving a fee based on the cost of physical disconnection to be paid when a customer is provided a logical disconnection would, in essence, be charging a fee for a process that does not occur. With the advantages to renewing service inherent in maintaining the physical link between the customer and the CO, logical disconnection is an efficient practice. Thus, disconnection charges should be modeled separately from connection charges.

MCI and AT&T's Non-Recurring Cost Study

273. MCI and AT&T submitted two versions of their non-recurring cost model (NRCM) during the proceeding. It develops 46 non-recurring charges for the functional activities associated with installation, disconnection, and migration of a customer from one carrier to another. The NRCM assumes the efficient use of existing operational support systems. The fallout rate resulting from errors in the ordering process, whether due to human error, mismatches in the data bases, or other problems with the process, is assumed to be 2%. The NRCM also makes the assumption that any travel time necessary for technician dispatch would average 20 minutes and that each trip would result in four work activities being resolved.

274. NRCM default values assume 58% of the lines are served by copper feeder and the remaining 42% with fiber. The use of copper results in additional manual steps in the provisioning process, thereby increasing the non-recurring cost.[338] This copper/fiber ratio is consistent with the assumptions contained in the HAI Model that Digital Loop Carrier is used for loop feeder over nine kilofeet.[339]

275. NRCM uses 1997 labor rates as the default value in its cost study whereas U S WEST used 1996 labor rates. Ms. Peirce's analysis found that the rates proposed by AT&T are generally higher than those used by U S WEST even when comparing AT&T's rates to U S WEST's 1997 rates. Ms. Peirce's testimony provides an example of the higher rates used by AT&T for the switch control center.[340]

276. NRCM separates connection and disconnection costs unlike U S WEST's model which combines them. NRCM recognizes that the increased use of soft dialtone reduces the actual physical disconnection of the lines when service is changed.[341]

277. NRCM assumes the initial ordering and provisioning process is handled completely electronically. Therefore, the initial steps do not include any provision for fallout, errors, or service center assistance. The only cost incurred is computer processing time which is

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[335] Ex. 615 at 34-35.
[336] Ex. 335 at 24.
[337] Ex. 308 at 6-7.
[338] Ex. 615 at 40.
[339] Ex. 617 at 8.
[340] Ex. 615 at 40.
[341] Id. at 41.

recovered from recurring rates under AT&T's model. This contrasts with U S WEST's assumption that the initial order process is entirely manual.[342]

278. While MCI and AT&T did not provide any work papers supporting its assumption that certain costs could be recovered through a recurring charge or of its time estimates and probabilities of certain work activities occurring, it indicated that these assumptions were based on the professional judgment of its experts.[343] At the hearing, AT&T witness Petti testified that the small team of subject matter experts that determined the times used in the time studies had experience with numerous local exchange companies including U S WEST. These time study determinations were made beginning in the summer of 1997.[344]

279. NRCM utilizes an overhead cost factor of 10.4% for each of the 46 non-recurring charges it develops.

280. NRCM accounts for travel time in its model by including the average trip time in minutes as an input into the model. The default travel time is 20 minutes. By comparison, U S WEST's non-recurring cost studies estimate travel time at 21 minutes in the unbundled loop study, 20 minutes in the cable unloading and bridge tap removal study, and at 26 in the Switched Transport and Network Interface Device studies. The NRCM differs from U S WEST's non-recurring model in the method it uses to spread travel cost among orders or work activities. The NRCM assumes travel costs to the central office are averaged over four work activities per trip. The number of work activities per trip is an input that can be adjusted into the NRCM; however, the input affects only activities performed at the central office and not other activities for which travel may be required.[345]

281. The NRCM assumes that 80% of lines are served by a staffed central office. This figure is in line with information presented by U S WEST during the proceeding stating how its central offices are staffed.[346]

282. The appropriate fallout rate is much contested in this proceeding. AT&T recommends a two percent fallout rate be utilized for all activities. AT&T supports this recommendation on two grounds. First, AT&T asserts that a two percent fallout rate is reasonable given the use of highly efficient operations support systems. Second, AT&T argues that other operations support systems have achieved a similar fallout rate.[347]

283. The evidence provided by U S WEST in this proceeding indicates that it does not maintain fallout by service categories but it did identify the number of total service order errors at 308,910 for 1996 for Iowa, Minnesota, Nebraska, North and South Dakota. U S WEST also presented evidence that a total number of service orders for these same states was 6,757,667 for the same time period. These figures result in a fallout rate of 4.6%.[348]

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[342] *Id.*
[343] *Id.* at 41-42.
[344] Tr. Vol. 8A at 8.
[345] Ex. 617 at 6.
[346] Id. at 8.
[347] Ex. 615 at 38.
[348] *Id.* at 39.

The historical fallout rates experienced by Bellsouth and U S WEST provide support for the two percent fallout rate proposed by AT&T for POTS services.[349]

284. As noted above, the NRCM does not assign any time or cost to customer service activities. While U S WEST's contention that every order should require manual intervention and customer service support is unreasonable, so too is the contention of NRCM that such human intervention will never be necessary. AT&T recognizes in its testimony that some service center support will occur at least minimally. While the NRCM anticipates such assistance being available, the model fails to reflect any costs associated with the assistance.[350] The non-recurring cost associated with service ordering should be included in the NRCM.[351]

Recommendations Concerning Non-Recurring Costs.

285. The ALJ recommends that the Commission adopt the &T's NRCM with modifications as described below. U S WEST's non-recurring cost studies should be rejected because they rely on outdated time studies, and are not forward-looking. Further, U S WEST's fallout rates, if adopted, would result in U S WEST providing CLECs with discriminatory access to its OSS.

286. The ALJ further recommends that the Commission adopt a two percent fallout rate for POTS and resale services and a 4.6% fallout rate for complex or designed services. Use of the two percent rate for POTS and resale is supported by the experience of Southwestern Bell, Bellsouth, the numbers provided by U S WEST in response to AT&T information request number 23 and DPS information request number 45.

287. While the evidence supports a two percent fallout rate for POTS and resale orders, even AT&T witness Petti recognized that orders for designed services require more manual intervention than POTS or resale orders.[352] Therefore, a two percent fallout rate would be inappropriately low for other than POTS and resale services.

288. The NRCM common overhead factor should be adjusted to 13.09%, as recommended for the other studies.

289. The NRCM should be amended to reflect the cost of customer service assistance in accordance with the appropriate fallout rates.

INTERIM NUMBER PORTABILITY

290. US WEST objected to using the "bill and keep" method of allocating costs for interim number portability.[353] In its place, US WEST proposes adoption of a system negotiated with a competitor. DPS pointed out that bill and keep was adopted as the cost

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[349] *Id.*
[350] Ex. 617 at 4-5.
[351] Id. at 15; Ex. 300 at 36; Ex. 338 at 26; Ex. 619 at 15.
[352] Ex. 335 at 11.
[353] US WEST Brief, at 58.

allocation method by the Commission.[354] MCI and AT&T pointed out that having each carrier pay its own cost has been adopted by the FCC.[355] While US WEST maintains that the outcome of bill and keep is to deny any significant compensation to the ILEC, there is no evidence that the adopted bill and keep method has been ruled invalid in any other proceeding regarding Minnesota rates. Bill and keep remains the methodology that should be used to compensate all carriers for costs regarding interim number portability.

Based upon the foregoing findings and conclusions, the Administrative Law Judge makes the following:

RECOMMENDATIONS

The Administrative Law Judge respectfully recommends that the Public Utilities Commission:

1. Use the HAI model to estimate U S WEST's UNE costs, but do not deaverage UNE prices at this time. If the Commission decides to deaverage prices, that should be done only for geographic areas no smaller than wire centers.

2. Set the common overhead factor at 13.09%.

3. Set the network support factor at 85%.

4. Set cost of capital at 9.6%.

5. Spread loop related overhead expenses on a per loop rather than a per dollar of investment basis.

6. Set depreciation parameters for projection lives and salvage percentages at the values recommended by the Department in its August 15, 1997 Comments in Docket No. P421/D-891.

7. Use HAI default regional labor adjustment factor for Minnesota (.99).

8. Adopt the drop lengths and drop placements by density zone as set out in Mr. Legursky's testimony.

9. Use the distribution structure mix parameters described by Mr. Legursky and set the fraction available for shifting away from the preassigned structure mix equal to zero.

10. Use the structure sharing parameters described by Mr. Legursky at Ex. 603 at 48-49; Ex. 604, JWL-2, Tables 18-19.

11. Use the buried placement cost parameters described by Mr. Legursky at Ex. 603 at 50; Ex. 604, JWL-2, Tables 20-21.

12. Change the weighted average price for channel units to that recommended by Mr. Legursky at Ex. 603 at 53-54.

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[354] Docket No. P421,442/M-96-855; Order Resolving Arbitration Issues, at 41-42 (December 2, 1996).
[355] Ex. 341 at 23.

13. Adjust the model to allow for dedicated idle.

14. Adopt AT&T's methodology for estimating the costs of special access lines on a pair-equivalent basis in the distribution plant and on a circuit-equivalent basis in the feeder plant.

15. Fix the error in calculating the line card costs related to special access lines.

16. Use actual line count data including the special access line count data requested by Dr. Fagerlund and remove the 32 sold exchanges.

17. Reject the SPOT frame proposal and require U S WEST to provide unbundled network elements in combination as requested by CLECs and to recombine them on behalf of CLECs.

18. Use the MCI/AT&T Collocation Cost Model to estimate collocation costs, but with its overhead factor modified to 13.09%.

19. Deny any U S WEST recovery of OSS costs until U S WEST provides CLECs non-discriminatory access to OSS interfaces and until the Company provides reliable cost support for its proposed rates.

20. Use the MCI/AT&T NRCM to estimate non-recurring costs with the following modifications:

a. Use a two percent fallout rate for POTS resale services and a 4.6% fallout rate for complex or designed services;

b. Use an overhead factor of 13.09%;

c. Account for the cost of customer service assistance with an appropriate fallout rate.

21. Adopt Bill and Keep as the cost recovery methodology for Interim Number Portability.

Dated: November 17, 1998

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STEVE M. MIHALCHICK
Administrative Law Judge

NOTICE

Notice is hereby given that, pursuant to Minn. Stat. § 14.61, and the Rules of Practice of the Public Utilities Commission and the Office of Administrative Hearings, exceptions to this Report, if any, by any party adversely affected must be filed within 20 days of the mailing date hereof with the Executive Secretary, Minnesota Public Utilities Commission, 350 Metro Square, 121 7th Place East, St. Paul, Minnesota 55101. Exceptions must be specific and stated and numbered separately. Proposed Findings of Fact, Conclusions

and Order should be included, and copies thereof shall be served upon all parties. If desired, a reply to exceptions may be filed and served within ten days after the service of the exceptions to which reply is made. Oral argument before a majority of the Commission will be permitted to all parties adversely affected by the Administrative Law Judge's recommendation that request such argument. Such request must accompany the filed exceptions or reply, and an original and 15 copies of each document should be filed with the Commission.

The Minnesota Public Utilities Commission will make the final determination of the matter after the expiration of the period for filing exceptions as set forth above, or after oral argument, if such is requested and had in the matter.

Further notice is hereby given that the Commission may, at its own discretion, accept or reject the Administrative Law Judge's recommendation and that the recommendation has no legal effect unless expressly adopted by the Commission as its final order.