AT&T/WorldCom also argue that the use of nationwide data generally avoids the need to verify the reasonableness of a company's data.[371]

133. AT&T/WorldCom recommend a different approach for common support expenses.[372] Common support services expenses include the cost of corporate operations (*e.g.*, legal and human resources), customer service (*e.g.*, marketing and billing), and plant non-specific expenses (*e.g.*, engineering and power).[373] In the universal service context, the Commission determined that common support services expenses should be calculated on a per line basis, rather than as a percentage of investment.[374] Specifically, the Commission ran a regression analysis using nationwide data for 1996, 1997, and 1998, to derive a per line amount for each type of common support expense.

134. AT&T/WorldCom propose replacing the per line common support expenses used in the SM with an eight percent factor that is multiplied by Verizon's actual 2000 expenses.[375] The eight percent factor is derived from 2000 data and, according to AT&T/WorldCom, is consistent with the downward trend in overhead expenses among the BOCs. AT&T/WorldCom state that use of 2000 data is generous and actually overstates overhead expense because these data reflect one-time merger-related expenses.[376] As an alternative approach to calculating common support expenses, AT&T/WorldCom recommend replacing the 1998 nationwide expense and investment data used by the Commission in the *Inputs Order* with actual Verizon data for 2000, and then using an out-of-model worksheet to allocate costs to particular UNEs, rather than allocate them on a per line basis as the SM does.[377]

135. Verizon opposes AT&T/WorldCom's proposal. Most significantly, Verizon argues that the application of expense ratios based on current investment and current expenses to "steeply-discounted, forward-looking" investment erroneously assumes that decreases in investment lead to automatic, proportionate decreases in expenses.[378] While Verizon acknowledges generally that expenses should fall as a result of the deployment of forward-looking technology, it argues that these decreases are based on changes in productivity, rather

(Continued from previous page)

[370] AT&T/WorldCom Initial Cost Brief at 111.

[371] *Id.* at 112.

[372] AT&T/WorldCom Ex. 1, at 12-13.

[373] *Inputs Order*, 14 FCC Rcd at 20318-19, para. 377.

[374] *Id.* at 20321, para. 382.

[375] AT&T/WorldCom Ex. 1, at 12-13.

[376] *Id.* at 15.

[377] *Id.* at 11.

[378] Verizon Initial Cost Brief at 169.

than changes in the investment required for particular types of equipment.[379] As discussed above, Verizon also argues that the use of nationwide data, rather than carrier-specific data, is inappropriate in a UNE pricing proceeding.

3. Discussion

a. Plant-Specific Expenses

136. We agree with Verizon that ratios based on Verizon-specific data for 1999 are the most appropriate starting point for developing ACFs in this proceeding.[380] The purpose of this proceeding is to set UNE prices based on the forward-looking cost to Verizon of providing those UNEs. Although it is appropriate in the universal service context to use nationwide figures, it is preferable to use Verizon-specific inputs when calculating UNE rates for Verizon because it is reasonable to expect that the relationship between investment and expenses may be different for Verizon than it is for other incumbent LECs.

137. Although we agree with Verizon with respect to the starting point for developing ACFs, we do not agree with the "forward-looking" adjustments it makes. Both sides agree that the use of forward-looking technology should reduce expenses because of increased efficiencies. However, there are significant differences between the parties in how they attempt to capture these efficiencies in their calculation of expenses. By applying expense ratios based on 1997 and 1998 data to TELRIC investment (at least for plant-specific expenses), AT&T/WorldCom assume that the relationship between investment and expenses will remain constant as the amount of investment falls.[381] Verizon, on the other hand, assumes that the level of expenses will change based only on underlying changes in productivity and inflation.

138. In theory, Verizon is correct that forward-looking expenses can be calculated by applying a productivity factor to current expenses. In this case, however, Verizon's position that productivity in a competitive environment will be no more than inflation (*i.e.*, that costs will not decline due to productivity gains) is not supported by the evidence on the record. As Verizon's witness acknowledged, its proposed productivity factor reflects only labor productivity, and not total factor productivity (TFP).[382] Moreover, the only evidence Verizon offered in support of its

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[379] Verizon Ex. 122, at 23-27.

[380] Ideally, we would use the average of two or three years as the Commission did in the *Inputs Order*. In this case, however, the record provides no evidence on whether years other than 1999 are representative of Verizon's experience.

[381] As noted above, AT&T/WorldCom propose a different approach for common support expenses.

[382] Tr. at 3880. TFP measurement is a methodology commonly used to measure productivity and productivity growth in the economy as a whole. Productivity is measured as the ratio of an index of the outputs of a firm (or industry, or nation) to an index of its inputs. Productivity growth is measured by changes in this ratio over time. *See, e.g., Price Cap Performance Review for Local Exchange Carriers*, CC Docket No. 94-1, Further Notice of Proposed Rulemaking, 14 FCC Rcd 19717, 19720-21, para. 11 (1999).

productivity factor was a single page summarizing the factors for each year, with no supporting documentation. We do not find this conclusory evidence convincing. Furthermore, we note that in other state proceedings Verizon has recognized significantly higher levels of productivity than it has proposed here.[383]

139. For similar reasons, we reject the FLC factor advocated by Verizon. The purpose of the ACFs is to calculate forward-looking expenses by multiplying an expense-to-investment ratio by forward-looking investment. Although Verizon purports to do this, in fact it estimates forward-looking expenses based on past expenses, adjusted for productivity and inflation as described above. Then, with the FLC factor, Verizon develops its ACFs, which it then uses to "calculate" the same forward-looking expense figure with which it started. As AT&T/WorldCom note correctly, the approach taken by Verizon is circular because it starts with forward-looking expenses, which is supposed to be the end result of the ACF calculation.

140. Because Verizon's FLC adjustment does not produce a meaningful estimate of forward-looking expenses, and therefore is inconsistent with the Commission's TELRIC pricing rules,[384] we will depart slightly from baseball arbitration and use an alternative adjustment to the 1999 embedded investment figures. Specifically, rather than multiply Verizon's 1999 investment figures by the FLC factor, we believe the better approach is to multiply these figures by a CC/BC ratio, as AT&T/WorldCom propose.[385] As the Commission explained in the *Inputs Order*, the CC/BC ratio is necessary to convert the embedded investment figures to current investment figures.[386] The CC/BC ratio is greater than 1.0 for accounts where costs have increased over time, and less than 1.0 for accounts where costs have declined over time.[387] Because the record does not include CC/BC ratios for Verizon for 1999, we will use the 1998 CC/BC ratios adopted by the Commission in the *Inputs Order*.[388] These ratios represent the

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[383] Tr. at 3804; *New York Commission Pricing Decision* at 53.

[384] 47 C.F.R. § 51.505(d)(1).

[385] We direct Verizon to follow a similar approach (*i.e.*, replacing the FLC factor with a CC/BC factor) in recalculating its right-to-use factor. *See infra* section V(C)(7).

[386] *Inputs Order*, 14 FCC Rcd at 20302-03, 20317, paras. 342, 374.

[387] In contrast, Verizon's FLC factor is the same for all accounts. Because the FLC factor is multiplied by embedded investment figures that do not reflect price changes over time, the resulting ratio may not accurately reflect the expense ratio that would be anticipated in a forward-looking environment. For example, the ratio of Verizon's 1999 expenses to 1999 embedded investment for poles is .151. The 1998 CC/BC factor adopted by the Commission in the *Inputs Order* is 2.398, which reflects the fact that the cost of installing poles has increased over time. Inputs Order, 14 FCC Rcd at 20420, App. D at D-4. Adjusting the pole investment to reflect this trend, the ratio of 1999 expenses to 1999 current investment is .064. In contrast, applying Verizon's proposed FLC to the 1999 embedded investment figure produces an expense ratio of .191, which significantly overstates the costs associated with poles.

[388] *Inputs Order*, 14 FCC Rcd at 20420, App. D at D-4.

results from five incumbent LECs, two of which were Bell Atlantic and GTE.[389] Accordingly, in the absence of record evidence of Verizon's actual CC/BC ratios, these ratios should serve as an adequate estimate.

141. For all these reasons, we reject Verizon's forward-looking adjustments and calculate plant-specific expenses by applying, to TELRIC investment, expense ratios based on 1999 expenses and 1999 investment, adjusted by CC/BC ratios.[390] The use of TELRIC investment, which assumes the most efficient technology, ensures that the cost calculated through an ACF based on current expenses and investment is forward-looking and that it reflects anticipated productivity gains. Although Verizon may be correct that expenses do not change in exact proportion to changes in the value of assets, the Commission has used current expense ratios in the past,[391] and we think it is reasonable to follow a similar approach in the calculation of UNE prices. Because we apply the expense ratios to forward-looking investment, additional adjustments generally should be unnecessary unless we can anticipate with some certainty that the underlying relationship between investment and expenses will change in the future, *i.e.*, that the relationship between expenses and investment in 1999 is not representative of what would be expected on a forward-looking basis.[392] We discuss in section III(E)(3)(c) below certain adjustments that have been proposed by the parties.

b. Common Support Expenses

142. The parties take very different approaches to the calculation of some components of common support expenses. We provide below a brief discussion of each of the relevant components. In some cases, neither party proposes an approach that can be implemented both in the MSM and in Verizon's switching and transport models. In these cases, for reasons we explain below, we will retain the treatment of the expense in the MSM and direct Verizon to modify how the expense is reflected in its models.

143. *Common Overhead.* The parties take a relatively similar approach to calculating common overhead expense. Specifically, both sides propose applying a mark-up factor to direct expenses of approximately eight percent.[393] This mark-up is intended to recover the costs of the

[389] *Id.* at 20305, para. 347.

[390] Appendix B shows the plant-specific ratios based on these calculations. Because these ratios do not incorporate Verizon's forward-looking adjustments to the investment figure in the denominator, Verizon should back out from its models the corresponding forward-looking adjustment to the expense figure in the numerator, *i.e.*, the productivity and inflation factors it applies within the models.

[391] *Inputs Order*, 14 FCC Rcd at 20304, para. 346.

[392] Although Verizon proposed a 5 percent adjustment to copper maintenance and repair expense, and AT&T/WorldCom advocated a 30 percent adjustment, those adjustments were to Verizon's proposed ACFs. Because we are not using Verizon's proposed ratios, we do not think either proposed adjustment is necessary.

[393] Verizon Ex. 107, at 66-69; AT&T/WorldCom Ex. 1, at 12-13.

Executive and Planning accounts and the General and Administration accounts.[394] Because the proposals on this issue are so similar, we will retain the treatment of common overhead in each of the models.

144. *Wholesale Marketing Expense.* AT&T/WorldCom propose that expenses associated with advertising should not be considered in calculating the ACFs. AT&T/WorldCom assert that all of these expenses are retail-related and not appropriately recovered in UNE rates. In support of their position, AT&T/WorldCom argue that the Commission excluded over 95 percent of these costs in developing inputs to be used in calculating universal service support.[395] Verizon states that AT&T/WorldCom improperly exclude all marketing costs from the MSM. Verizon argues that many of these costs are related to wholesale marketing functions it performs, such as product forecasting, product management, and regulatory implementation.[396] Verizon also argues that even advertising expenses need not be totally excluded because wholesale advertising likely would occur in a competitive marketplace.[397] Verizon suggests that a more detailed analysis of the marketing account is needed to determine which expenses, if any, should be excluded.

145. We agree with AT&T/WorldCom that advertising and marketing expenses should be removed. As the Commission found in the *Inputs Order*, retail-related expenses, which these are, should not be included in the calculation of ACFs.[398] Although it is possible that Verizon will engage in wholesale advertising and other wholesale marketing in the future, Verizon has not explained adequately the basis for the significant costs it proposes to include in the ACFs. Verizon's assumption that forward-looking wholesale advertising expense will be the same as current retail advertising expense is not supported by any objective evidence in the record. Accordingly, the exclusion of these costs from the MSM should be retained, and the Wholesale Marketing factor should be zeroed out in Verizon's models.

146. *Network Operations Expense.* Verizon proposes to recover the costs in this set of accounts by applying a loading factor to its Network factor, rather than through an independent expense factor.[399] AT&T/WorldCom propose to calculate network operations expense based on Verizon's actual 2000 data, adjusted forward to 2002, and allocated to individual UNEs through an out-of-model calculation.[400] Because of the vastly different approaches taken by the parties, it

[394] Verizon Ex. 107, at 66; AT&T/WorldCom Ex. 23, at 7.

[395] Tr. at 3910. The Commission initially proposed including 4.4 percent of marketing costs, but revised this to 5.82 percent. *Inputs Order*, 14 FCC Rcd at 20334, para. 407.

[396] Verizon Ex. 109, at 69-70.

[397] Verizon Ex. 107, at 41-46.

[398] *Inputs Order*, 14 FCC Rcd at 20331, para. 401; *see also* 47 C.F.R. § 51.505(d)(2).

[399] Verizon Ex. 107, at 58.

[400] AT&T/WorldCom Ex. 1, at 13-16.

is difficult even to compare the two proposals, let alone identify a single approach that can be used both in the MSM and in Verizon's models. The parties agree, however, on the approximate amount of costs to be recovered.[401] Accordingly, we will retain AT&T/WorldCom's treatment of Network Operations expense in the MSM. Because we have established specific expense factors to be used for plant-specific expenses, Verizon's proposal to recover those costs through loading factors is not feasible. Instead, we direct Verizon to increase the Common Overhead factor in its models to recover the amount that would have been recovered through the loading factors.

147. *Customer Service Expense.* Verizon proposes to recover Customer Service expense through its Wholesale Marketing factor.[402] AT&T/WorldCom use the per line figure for customer service expense used by the SM in the universal service context, and allocate it across UNEs through an out-of-model calculation.[403] Verizon argues that the $1.69 per line per month customer service expense used in the MSM is based on old data and is not accurate.[404] In response, AT&T/WorldCom state that Verizon itself excludes much of this expense in its model, and that the amount of expense included in the two models is similar.[405] As with other components of the common support expenses, it is difficult to compare the two proposals and to develop a single approach that will work in all the models. Accordingly, we will retain the treatment of customer service expense in the MSM. As with Network Operations expense, we direct Verizon to increase its Common Overhead factor so that it recovers an amount equal to the amount of customer service expense that would have been recovered in its Wholesale Marketing factor.

148. *Uncollectibles.* In establishing UNE prices, it is appropriate to increase the amount of cost to be recovered by a factor that reflects the fact that some portion of charges will not be paid by Verizon's competitive LEC customers. In the universal service context, the SM grosses up common support expenses to reflect an amount for uncollectibles.[406] AT&T/WorldCom do not state that they have changed the treatment of uncollectibles in converting the SM to the MSM, and Verizon does not challenge the treatment of uncollectibles

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[401] Verizon Ex. 108, at 62-63 (AT&T/WorldCom identify $110 million in network operations expense, as compared to Verizon's identification of $106 million).

[402] Verizon Ex. 107, at 63-64.

[403] AT&T/WorldCom Ex. 1, at 16.

[404] Verizon Ex. 109, at 75.

[405] Specifically, AT&T/WorldCom witness Pitkin states that the MSM includes over $11 million in customer service expense. AT&T/WorldCom Ex. 14, at 70.

[406] *Inputs Order*, 14 FCC Rcd at 20321, para. 382, n.855. The SM assumes an uncollectible rate of 5.26 percent of common support expenses ($7.32 per month common support expense x 12 months x 1.0526 = 92.463 annual common support expense.).

in the MSM.[407]

149. Verizon proposes a separate Gross Revenue Loading factor to account for uncollectibles, as well as regulatory assessments. It proposes an uncollectible rate of .56 percent of revenues, which was the rate it experienced in 1999 for IXC customers.[408] This ratio is expressed as a ratio of expenses to gross revenue and is applied as a mark-up to total cost.[409]

150. As with other aspects of common support expenses, it is difficult to compare the two proposals and to develop a factor that can be used in the various models we use to develop rates. Accordingly, we will retain the treatment of uncollectibles contained in each of the proposed models. That is, the models we use in developing UNE rates (the MSM and Verizon's switching and transport models) will be run without any changes to the manner in which those models account for uncollectibles.

c. Proposed Adjustments

151. *General Support Expense.* As explained in the *Inputs Order* in the universal service context, the SM reduced general support facilities (GSF) expense by 32 percent to reflect costs associated with special access and toll, which are not supported by the universal service support mechanism.[410] Verizon states that AT&T/WorldCom have inappropriately retained this exclusion.[411] In response, AT&T/WorldCom state that GSF expense associated with serving wholesale customers should be significantly lower than GSF expense for retail services (*e.g.*, fewer customer service representatives require less building space).[412] AT&T/WorldCom state that they were generous in not excluding more than the 32 percent that the SM excludes. We agree with Verizon that the reduction in GSF expense is inappropriate. The exclusion in the SM was based on the fact that certain services are not supported by the universal service support mechanism. AT&T/WorldCom did not demonstrate that the 32 percent reduction correlates to any anticipated reduction in GSF expenses beyond the reduction that results from multiplying the expense ratio by TELRIC investment.

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[407] AT&T/WorldCom Ex. 23, at Vol. 1 at 6-10.

[408] Verizon Ex. 107, at 70, 356-57. Verizon submitted late-filed testimony proposing to increase the Gross Revenue Loading Factor included in its original cost studies. In its November 2002 filing, Verizon argues that the Commission should use the 8.34 percent rate that Verizon experienced with competitive LECs in 2001. According to Verizon, its experience to date in 2002 indicates that the 2001 rate is the start of a continuing trend toward much higher rates of uncollectibles. Verizon submitted an even higher figure in its April 2003 proffer. As discussed in section II(B)(2) above, we will not consider Verizon's late-filed testimony on this issue.

[409] Verizon Ex. 107, at 49-50.

[410] *Inputs Order*, 14 FCC Rcd at 20425, App. D at D-9; AT&T/WorldCom Ex. 14, at 71.

[411] Verizon Ex. 108, at 58-60; Verizon Ex. 109, at 111-13.

[412] AT&T/WorldCom Initial Cost Brief at 110.

152. *Merger Savings.* AT&T/WorldCom argue that Verizon's proposed ACFs are flawed because Verizon fails to include a specific adjustment to reflect the anticipated future savings associated with the Bell Atlantic/NYNEX and Bell Atlantic/GTE mergers.[413] AT&T/WorldCom propose that the increased productivity that Verizon hopes to gain through these mergers should be reflected in the forward-looking costs developed in this case. Specifically, AT&T/WorldCom propose a reduction in the common overhead factor proposed by Verizon.[414] Verizon responds that the amount of actual merger savings is subject to significant uncertainty and the projections made by the company at the time of the merger reflect many parts of the company other than local telephony, such as wireless and long distance.[415] Verizon also suggests that future increases in productivity due to the merger are reflected in its productivity factor.[416]

153. We agree with Verizon that an adjustment for proposed efficiencies realized through the mergers is unnecessary. As discussed above, multiplying expense ratios based on 1999 data by TELRIC investment will ensure that Verizon does not recover more than the forward-looking cost of providing UNEs. To warrant a further downward adjustment, we would need to quantify efficiencies solely attributable to the mergers, above and beyond the efficiencies attributable to the TELRIC assumption that Verizon will use the most efficient technology available. When the Commission reviewed each merger, it was not convinced that there would be substantial merger-specific cost savings.[417] The Commission's finding in both merger decisions that there would be only limited merger-specific cost savings supports our decision to reject AT&T/WorldCom's proposed adjustment.

154. *Y2K Expenses.* AT&T/WorldCom argue that a specific adjustment is needed to back out expenses incurred by Verizon in making its computer systems "Y2K" compliant. AT&T/WorldCom assert that these one-time expenses, which are included in the 1999 figures used by Verizon, will not be incurred on a forward-looking basis and should not be recovered through UNE rates.[418] Verizon argues that the proposed exclusion for Y2K expenses is unwarranted. According to Verizon, Y2K expenses are simply part of its annual Information

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[413] AT&T/WorldCom Ex. 12, at 87.

[414] *Id.* at 88.

[415] Verizon Ex. 107, at 47.

[416] *Id.* at 48-49.

[417] *In re Application of GTE Corp. and Bell Atlantic Corp. for Consent to Transfer Control of Domestic and International Sections 214 and 310 Authorizations and Application to Transfer Control of a Submarine Cable Landing License*, CC Docket No. 98-184, Memorandum Opinion and Order, 15 FCC Rcd 14032, 14141-42, paras. 241-42 (2000); *In re Applications of NYNEX Corp. and Bell Atlantic Corp. for Consent to Transfer Control of NYNEX Corporation and its Subsidiaries*, File No. NSD-L-96-10, Memorandum Opinion and Order, 12 FCC Rcd 19985, 20066-68, paras. 169-73 (1997).

[418] AT&T/WorldCom Ex. 12, at 92.

Systems budget, and the dollars spent on Y2K would have been spent on other projects but for the Y2K problem.[419] Verizon states that the company did not increase its 1999 Information Systems budget to deal with Y2K, and its expenses for the following year were actually higher than in 1999.[420] We agree with Verizon that Y2K compliance expenditures should be included in calculating the ACFs. Although Y2K was a one-time event, Verizon has credibly demonstrated that the amount of spending for Information Systems in 1999 was not unduly inflated due to Y2K.

155. *Non-Recurring Expenses.* Verizon asserts that it has removed all non-recurring expenses from the numerator in its Network ACF because it proposes to recover these costs through NRCs.[421] Because Verizon's accounting system does not actually identify costs as recurring or non-recurring, it has used the amount of non-recurring revenue (retail and wholesale) as a proxy for non-recurring expenses.[422] AT&T/WorldCom argue that this adjustment should not be made because these costs are not appropriately recovered through NRCs.[423]

156. In section X(C)(1), we explain that costs associated with initiating service to competitive LECs generally should be recovered in recurring charges (through the application of ACFs), rather than through NRCs. The costs at issue are labor costs associated with the activities necessary to provide UNEs to a competitive LEC. In many cases, these activities will produce benefits for any carrier using the facility in the future, and not just the initial competitive LEC for which the work is performed (*e.g.*, cross-connects made to complete a connection are likely to remain in place even if the end-user customer no longer takes service from the competitive LEC). Costs of non-recurring activities that benefit only the competitive LEC, or are not reflected in Verizon's ACF calculation (*e.g.*, certain types of loop conditioning), should be recovered through NRCs.

157. Allowing even this limited set of NRCs creates a potential for double recovery without an adjustment to the ACFs. However, AT&T/WorldCom propose no such adjustment and based on the record before us we have no basis on which to develop one. Although Verizon proposes an adjustment based on its retail NRCs, it is unclear whether retail NRCs actually recover all the costs associated with retail non-recurring activities,[424] and there is no evidence as to how Verizon's retail NRC revenues relate to the limited set of expenses we allow it to recover

[419] Verizon Ex. 107, at 39-40.

[420] *Id.*

[421] *Id.* at 60.

[422] Verizon Ex. 107, at 60-61; Tr. at 4770.

[423] AT&T/WorldCom Ex. 12, at 93-94. AT&T/WorldCom do, however, advocate removal of all retail-related expenses. AT&T/WorldCom Ex. 1, at 15-16.

[424] Tr. at 4781.

through NRCs in this proceeding. Accordingly, we agree with AT&T/WorldCom that no adjustment should be made for non-recurring expenses in any of the ACFs.

158. *OSS-Related Expenses*. Verizon has removed costs associated with providing competitive LECs with access to its OSS from the calculation of the Other Support ACF. Verizon argues that these costs are more appropriately recovered through its proposed Access to OSS network element.[425] AT&T/WorldCom argue that the expenses associated with providing access to OSS should not be recovered through a separate UNE charge, but instead should be recovered through the application of ACFs. Accordingly, AT&T/WorldCom state that the expenses removed by Verizon should be included in the ACF calculations.[426]

159. Because we allow Verizon to recover OSS costs through a separate UNE charge,[427] those costs should not be included in the calculation of the ACFs. Verizon should retain its proposed adjustment to the Other Support factor when running its models to develop switching and transport rates. Although ideally a comparable adjustment should be made in the MSM, the differences in the parties' proposals makes it difficult to determine how such an adjustment should be made. Accordingly, we will not make a corresponding adjustment in the MSM.

160. *LNP Expenses*. According to Verizon, AT&T/WorldCom inappropriately exclude expenses associated with Local Number Portability (LNP).[428] Verizon states that these costs will be incurred in a forward-looking environment. AT&T/WorldCom did not offer a specific response to Verizon on this point, but Verizon is correct that the MSM submitted by AT&T/WorldCom does not include any LNP expense. We conclude that AT&T/WorldCom's decision to exclude LNP expense in calculating ACFs was appropriate. The Commission has established a mechanism for recovery of LNP costs from end-users, and it has established a presumption that LNP costs should not be considered in setting UNE prices.[429] Verizon may be correct that there are some LNP costs that may be appropriate to include in calculating ACFs (*i.e.*, costs incurred after the five-year period for the end-user charge has lapsed), but Verizon has made no attempt to demonstrate the amount of any LNP cost that satisfies this criterion. Accordingly, LNP costs should not be included in the calculation of expense ratios.

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[425] Verizon Ex. 107, at 66.

[426] AT&T/WorldCom Ex. 12, at 94; Tr. at 3958.

[427] *See infra* section VII(C).

[428] Verizon Ex. 109, at 75.

[429] *Telephone Number Portability*, CC Docket No. 95-116, Third Report and Order, 13 FCC Rcd 11701, 11778, para. 146 (1998) ("[W]e presume that state commissions will not include the costs of number portability when pricing unbundled network elements.").

IV. LOOPS

A. Introduction

161. A loop refers to the transmission facility, including all of its features, functions, and capabilities, used to carry traffic between the distribution frame (or its equivalent) in an incumbent LEC central office and the demarcation point at an end-user customer premises. Because loop investments represent a considerably higher proportion of investment in the local plant than any other UNE,[430] establishing appropriate forward-looking unbundled loop rates is, perhaps, the single most important issue in this arbitration.

162. UNEs must be provided at rates established in accordance with the TELRIC methodology.[431] Although the Commission provided guidance regarding the overall TELRIC pricing principles in the *Local Competition First Report and Order*,[432] the Commission's rules provide only general guidance on the proper manner for an incumbent LEC to recover its loop costs. The rules state that total recurring loop costs are those costs directly attributable to the loop, plus a reasonable allocation of the forward-looking common costs,[433] and they require that an incumbent LEC recover its loop costs through flat-rated charges.[434]

163. The Commission's universal service orders provide further guidance on how to determine forward-looking loop costs.[435] Consistent with the *Local Competition First Report and Order*, the *Platform Order* states that a forward-looking cost model should model loops in a manner that, from an economic perspective, minimizes cost and maximizes efficiency and, from an engineering perspective, ensures that the modeled network supports the quality of services to be provided over the network.[436] Both the *Platform Order* and the *Inputs Order* provide

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[430] *Platform Order*, 13 FCC Rcd at 21335, para. 27 n.63 (stating that both the HAI and the BCPM cost models submitted in the universal service proceeding calculated the loop plant to represent over 70 percent of total network investment); *Local Competition First Report and Order*, 11 FCC Rcd at 15690, para. 378 n.818 (finding loop plant to constitute 48 percent of network plant of Class A carriers) (cited in *Verizon v. FCC*, 535 U.S. at 520).

[431] 47 C.F.R. § 51.501 (pricing rules apply to UNEs).

[432] *Local Competition First Report and Order*, 11 FCC Rcd at 15812-929, paras. 618-862. We discuss separately the TELRIC methodology and the relationship between the submitted cost studies and this methodology. *See supra* section III(A).

[433] 47 C.F.R. § 51.505(c); *Local Competition First Report and Order*, 11 FCC Rcd 15846-56, at paras. 679-703. We address common costs and NRCs elsewhere in this order. *See supra* section III(E) and *infra* section X.

[434] 47 C.F.R. §§ 51.507(b), 51.509(a); *Local Competition First Report and Order*, 11 FCC Rcd at 15874, para. 744.

[435] *See Universal Service First Report and Order*, 12 FCC Rcd at 8898-17, paras. 223-51; *Platform Order*, 13 FCC Rcd at 21333-53, paras. 21-70; *Inputs Order*, 14 FCC Rcd at 20164-279, paras. 12-285.

[436] *Platform Order*, 13 FCC Rcd at 21335, para. 26.

considerable, detailed guidance on the network design and inputs appropriate for a forward-looking cost study. To the extent that such guidance applies to specific model design, network design, or cost input issues, we discuss these orders in the following sections.

B. Choice of Cost Models for Loops

1. Positions of the Parties

164. Verizon proposes using the LCAM to generate rates for unbundled loops.[437] Specifically, Verizon proposes using this model to develop rates for the following loop types: two-wire analog loops, four-wire analog loops, off-premises extension loops, integrated services digital network (ISDN) BRI (*i.e.*, two-wire digital) loops, four-wire digital (*i.e.*, 56 and 64 kbps) loops, two-wire customer-specified signaling loops, four-wire customer-specified signaling loops, DS1/ISDN PRI loops, DS3 loops, xDSL-compatible loops, subloops, and dark fiber loops.[438]

165. To calculate its loop costs, Verizon attempts to identify for each loop component the material investment costs that it would incur to deploy a forward-looking network.[439] The LCAM utilizes three separate modules to identify these costs.[440] First is the Plant Characteristics Module. In this module, Verizon uses an internal company survey conducted from 1993 through 1995 to determine for each wire center the average distribution and feeder lengths, the typical cable sizes, and the plant mix (*i.e.*, aerial, buried, underground).[441] For cable costs, Verizon relies on the data in its Vintage Retirement Unit Cost (VRUC) system on installed cable costs from 1997 through 1999.[442] The second module is the Electronics Module. It determines the investment costs for digital loop carrier (DLC) systems.[443] The third module, the Loop Study Module, imports the results of the other two modules and then calculates loop investments by wire center.[444]

166. Verizon takes as the appropriate starting point for determining loop costs its

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[437] Verizon Ex. 107, at 31; *see also* Verizon Ex. 100P (Cost Study), Vols. I-III, XVI, Tab 7 (confidential version).

[438] Verizon Ex. 107, at 80-82; *see also* Verizon Initial Cost Brief at 79 n.76.

[439] Verizon Ex. 107, at 17, 32-33; Tr. at 4104; Verizon Initial Cost Brief at 80.

[440] Verizon Ex. 100P, Vol. I, Tab B-1 at 1-5 and Vol. XVI, Tab 7 at 11-16 (confidential version).

[441] *Id.*, Vol. I, Tab A-1 at 1, Tab B-1.2 at 1-3, and Vol. XVI, Tab 7 at 11-14 (confidential version); *see also* AT&T/WorldCom Ex. 12, at 12-14; AT&T/WorldCom Ex. 11 (Murray Rebuttal), at 28-29.

[442] Verizon Ex. 100P, Vol. I, Tab A-1 at 1 (confidential version); Verizon Ex. 107, at 117-18.

[443] Verizon Ex. 100P, Vol. I, Tab A-4 at 1, Tab B-1.2 at 1, 3, and Vol. XVI, Tab 7 at 14 (confidential version).

[444] *Id.*, Vol. I, Tab A-4 at 1, Tab B-1.2 at 1, 4, and Vol. XVI, Tab 7 at 14-15 (confidential version).

existing outside plant network,[445] and then makes forward-looking adjustments to conform to TELRIC principles.[446] In making these forward-looking adjustments, Verizon anticipates the technology mix that it expects to deploy in its outside plant at the end of its three-year study period. The LCAM thus models the loop plant that Verizon would deploy at the end of the three-year study period, assuming that this technology would be fully implemented throughout its network.[447]

167. AT&T/WorldCom offer two sets of critiques of the Verizon LCAM. First, AT&T/WorldCom claim that the LCAM violates basic TELRIC principles.[448] Specifically, AT&T/WorldCom criticize Verizon for failing to model a reconstructed network and, instead, making some forward-looking adjustments to its embedded network based on the network that Verizon plans to deploy at the end of its three-year study period.[449]

168. Second, AT&T/WorldCom propose to modify key inputs and assumptions used in the LCAM to enable it to produce forward-looking rates.[450] Although they claim that restating Verizon's cost studies based on these changes would generate more forward-looking rates than Verizon's studies as filed, AT&T/WorldCom nevertheless contend that it is impossible to quantify all of the adjustments necessary to correct the TELRIC flaws in Verizon's cost studies.[451] Thus, for the 2-wire, 4-wire, DS-1, and DS-3 loop types, AT&T/WorldCom propose adjusting the LCAM only in the event that we do not adopt their affirmative proposal, which we now describe.[452]

169. AT&T/WorldCom propose using a modified version of the Commission's

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[445] *See, e.g.*, Verizon Ex. 101, at 2, 6-7, 9-12, 20-22; Verizon Ex. 102 (Gordon Direct), at 10-16. One Verizon economist testified that "data based on current network investment and operating practices provide the most appropriate (and in many cases, the only sound) bases for the analysis." Verizon Ex. 102, at 15.

[446] *See, e.g.*, Verizon Ex.101, at 2, 5-6, 9-12, 20-22; Verizon Ex. 102, at 5, 10-16, 19-21, 33. Specifically, Verizon's chief economic witness stated that Verizon's recurring cost study "should try to measure the costs that Verizon VA, acting efficiently, will incur going forward to provide relevant network functions" and that the Verizon study "incorporates engineering guidelines that begin with the existing network and then call for deployment of the most efficient mix of technologies going forward." Verizon Ex. 101, at 20, 21.

[447] *See, e.g.*, Verizon Ex. 101, at 21-24; Verizon Ex. 102, at 5-7, 10-16, 19-21, 33.

[448] AT&T/WorldCom Ex. 11, at 6-24, 38.

[449] *Id.* at 6-8, 12-19, 38.

[450] AT&T/WorldCom Ex. 12, at 4-5, 11, 16, 18-20, 31, 36-45, 52, 54, 56, 62, 64-65, 70, 73, 75-79, 81 (proposed loop model changes); *see also* AT&T/WorldCom Ex. 11, at 19-33, 35-38 (proposed loop model changes).

[451] AT&T/WorldCom Ex. 12, at 5, 16, 19, 31.

[452] *Id.* at 16.

universal service SM, which they call the MSM, to generate 2-wire analog loop rates.[453] They then propose applying out-of-model calculations to the statewide average 2-wire loop costs produced by the MSM to generate rates for 4-wire loops and for DS-1 and DS-3 (high capacity) loops.[454] In constructing the MSM, AT&T/WorldCom begin with the SM developed by the Commission in the universal service proceedings and adjust several of its inputs and algorithms.[455] We analyze these changes individually, below.[456]

170. Verizon challenges the use of any form of the SM, including the MSM, to generate loop rates.[457] It claims that the SM was not designed to estimate company- and state-specific forward-looking UNE costs, and, even as modified by AT&T/WorldCom, it is incapable of estimating the forward-looking costs that Verizon will incur.[458] In addition, Verizon criticizes many of the specific inputs used in the MSM, some that were adopted by the Commission for use in the SM and others that are newly proposed by AT&T/WorldCom for use in the MSM.[459] As noted, we address these specific input issues below.[460]

2. Discussion

171. We find that the MSM is the better cost model to use to determine the costs, and thus to generate rates, for the basic 2-wire analog loop.[461] Specifically, the MSM more fully complies with the TELRIC methodology than does the LCAM. As we noted in the cost model section of this order, we disagree with Verizon's threshold argument that the Commission has precluded use of the SM to establish UNE rates.[462] Although the Commission cautioned against relying on the nationwide inputs adopted in the *Inputs Order*,[463] the Commission never found that the underlying model platform is inappropriate for use in determining UNE costs. Rather, the Commission developed the SM platform in an express effort to model a forward-looking

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[453] AT&T/WorldCom Ex. 23, Vol. 1 at 1-10; AT&T/WorldCom Ex. 1, at 1, Ex. D at 1-8, Attach. at 1-6; *see also* Verizon Ex. 109, at 19.

[454] AT&T/WorldCom Ex. 23, Vol. 1 at 10-12; AT&T/WorldCom Ex. 1, at 23-26, Ex. D at 1-8, Attach. 1-6.

[455] AT&T/WorldCom Ex. 23, Vol. 1 at 1-10; AT&T/WorldCom Ex. 1, at 1, 8-23; *see also supra* section III(B)(2).

[456] *See infra* sections IV(C).

[457] Verizon Ex. 108, at 7-21.

[458] *Id.* at 7-8, 13-14; Verizon Ex. 109, at 4-7.

[459] Verizon Ex. 109, at 3-124.

[460] *See infra* section IV(C).

[461] We address other loop types *infra* in section IV(D).

[462] *See supra* section III(B)(2).

[463] *See Inputs Order*, 14 FCC Rcd at 20172, para. 32.

network that reflects use of the most efficient, lowest cost network configuration, assuming existing wire center locations, that an efficient carrier would deploy.[464] The MSM is based on the same underlying forward-looking network design as the SM.[465] In contrast, the LCAM takes as its starting point Verizon's existing outside plant network, not just its existing wire center locations, and thus does not begin with the most efficient network design or technology.[466] Indeed, the network on which Verizon bases its costs is at least a decade old.[467] Verizon attempts to overcome this fact by making forward-looking adjustments to its current network.[468] We find that it is more consistent with the Commission's rules to adopt a cost model that begins with forward-looking technology and the lowest cost network configuration, rather than a model that applies forward-looking adjustments to embedded network design and technology assumptions.[469]

172. Further, the MSM is more transparent and verifiable than is the LCAM. The MSM incorporates the SM's algorithms and many of its cost inputs that were subject to extensive comment and analysis in the universal service proceeding, as well as to intense scrutiny by Verizon in this arbitration. The workings of the model are thus known well to the parties, as are the sources of the cost inputs. In contrast, Verizon did not make available the underlying sources of much of the data and formulas in its loop cost study. Verizon provides only the results of its loop plant survey and did not provide the studies underlying the survey results, either in their entirety or through a detailed or statistical summary, in this proceeding. Thus, the data contained therein are unavailable for review. Similarly, although Verizon uses weighted averages for certain inputs, such as average loop distance per ultimate allocation area (UAA), Verizon fails to explain how it arrived at its weights.[470] Further, the Verizon survey uses only one line per UAA, without explaining why or how this line is typical.[471] Moreover, although the Verizon study itself is available for review, its inherent complexity makes it substantially more difficult to undertake any meaningful sensitivity analyses. For example, the study documentation fails to explain the integration of the study's modules (*e.g.*, VCost, VRUC

[464] *See Platform Order*, 13 FCC Rcd at 21345-46, paras. 54, 66; *Inputs Order*, 14 FCC Rcd at 20171, 20188, paras. 29, 66.

[465] AT&T/WorldCom Ex. 1, at 1-2; AT&T/WorldCom Initial Cost Brief at 30.

[466] *See* 47 C.F.R. § 51.503(b)(1).

[467] Verizon Ex. 122, at 60; Verizon Initial Cost Brief at 82. For example, the surveys used to determine plant characteristics were completed by Verizon personnel beginning in 1993, and therefore reflect the characteristics of outside plant placed in earlier years. *See* Verizon Ex. 122, at 60; Verizon Initial Cost Brief at 82.

[468] Verizon Ex. 107, at 16, 94-99; Verizon Ex. 122, at 62-63; Verizon Initial Cost Brief at 82.

[469] *See* 47 C.F.R. § 51.505(b)(1).

[470] *See, e.g.*, Verizon Ex. 100P, Vol. 1, Part B-1, sections 4.5, 4.6 (confidential version); Verizon Ex. 107, Attach. B at 28-31; Verizon Initial Cost Brief at 80.

[471] Tr. at 4431-36.

database, LCAM) sufficiently for us to have confidence that changes made in one module flow into another properly. It is also not possible for the user to modify certain key VRUC data, such as line counts.[472] Accordingly, we will use the MSM to establish the rates for the basic 2-wire loop.

C. Loop Cost Model Implementation

173. Having decided to use the MSM to establish rates for the basic 2-wire loop, we turn to the myriad issues that the parties raise regarding the specific inputs and assumptions to use in the model. Both parties recognize that the rates derived from their respective models depend greatly on the inputs.[473] Thus, although we find that the MSM more closely complies with the Commission's TELRIC rules than does the LCAM, the selection of inputs and assumptions for use in the cost model is of major importance.

1. Cost Model Algorithms

174. In presenting the MSM, AT&T/WorldCom apply several changes to the algorithms used in the SM. These changes consist of programming logic changes to the cost model. Cost input figures are not directly affected by these changes. Specifically, AT&T/WorldCom modify: (1) the node selection criteria (*i.e.*, replace the modified PRIM algorithm with the unmodified PRIM algorithm); (2) the drop terminal dispersion locations; (3) the drop terminal orientation; (4) the customer lot size/configuration; (5) the residual line allocation; and (6) the possibility for microgrids to overlap.[474]

a. Network Design Algorithm (*i.e.*, PRIM Algorithm)

(i) Positions of the Parties

175. To optimize outside plant routing, AT&T/WorldCom propose using a network design algorithm, which they call the unmodified PRIM algorithm, instead of the algorithm used in the SM, which is termed the modified PRIM algorithm.[475] According to AT&T/WorldCom, the unmodified PRIM applies a distance methodology as opposed to the average cost methodology reflected in the modified PRIM algorithm.[476] They contend that the use of a distance algorithm

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[472] *See* AT&T/WorldCom Ex. 12, at 19; *see also* AT&T/WorldCom Initial Cost Brief at 46.

[473] *See* Tr. at 4391-93.

[474] AT&T/WorldCom Ex. 23, Vol. 1 at 3-4; AT&T/WorldCom Ex. 1, at 9, Ex. D at 1-8, Attach. 1-6; *see also* Verizon Initial Cost Brief at 147.

[475] AT&T/WorldCom Ex. 23, Vol. 1 at 4; AT&T/WorldCom Ex. 1, Ex. D at 6-7. The PRIM algorithm is named after its inventor Robert C. Prim. Robert C. Prim, *Shortest Connection Networks and Some Generalizations*, BELL SYSTEM TECHNICAL JOURNAL 36 at 1389-1401 (1957).

[476] AT&T/WorldCom Ex. 1, Ex. D at 6-7.

avoids the error of connecting less dense, but more distant serving area interfaces/feeder distribution interfaces (SAIs/FDIs) to the central office before connecting closer, less distant interfaces. In so doing, the unmodified PRIM allegedly avoids building duplicative plant that would be modeled if the modified PRIM algorithm were used.[477]

176. Verizon opposes the use of the unmodified PRIM algorithm, claiming that the Commission rejected it during the development of the SM and that it results in understated loop costs.[478] To show this understatement, Verizon compares the distribution distances resulting from the MSM to the results that would be generated by a minimum spanning tree (MST) algorithm, which calculates distance using airline miles.[479] Verizon applies a conversion factor to account for the fact that outside plant typically cannot be deployed in straight lines due to, for example, geographic obstacles and rights-of-way constraints.[480] Verizon claims that, in some DAs, the distribution distances resulting from the MSM are less than those generated by the MST.[481] Verizon therefore argues that use of the unmodified PRIM algorithm in the MSM fails to account for all of the outside plant necessary to connect customers to central offices.[482]

(ii) Discussion

177. We find it appropriate to use the unmodified PRIM algorithm in this arbitration context to optimize outside plant routing. The PRIM algorithm is an optimizing algorithm intended to design an efficient, low-cost outside plant network configuration. In either form, modified or unmodified, it will design a network sufficient to connect central offices to customer locations.[483] Although the Commission chose in the *Platform Order* to use the modified PRIM algorithm rather than the unmodified PRIM algorithm,[484] the only explanations provided are statements in the

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[477] *Id.*, Ex. D at 7.

[478] Verizon Initial Cost Brief at 146-47; Verizon Reply Cost Brief at 135 n.128.

[479] Verizon Ex. 108, at 43-45.

[480] *Id.* at 44.

[481] *Id.* at 45. Specifically, Verizon contends that on average the MSM distribution distance is 1.2 times the MST distances and that, in ten percent of the clusters, the MSM distribution distance is less than the MST distance. *Id.*

[482] *Id.* at 45; Verizon Initial Cost Brief at 147.

[483] *See* C.A. Bush, *et al.*, *Computer Modeling of the Local Telephone Network*, at 12 (Oct. 1999) (citing R.C. Prim, *Shortest Connection Networks and Some Generalizations*, BELL SYSTEM TECHNICAL JOURNAL, 36, 1289-1401 (1957) (describing an efficient algorithm for computing minimum distance networks) and J.C. Gower & G.J.S. Ross, *Minimum Spanning Trees and Single Linkage Cluster Analysis*, APPLIED STATISTICS, 18, 54-64 (1969) (containing a computed coded version of the Prim algorithm and some extensions)), submitted as AT&T/WorldCom Ex. 23, Vol. 1, Attach. B. An earlier version of this documentation was available when the *Platform Order* was adopted. *See Platform Order*, 13 FCC Rcd at 21336, para. 29 n.65.

[484] *See Platform Order*, 13 FCC Rcd at 21374, App. A. para. 33.

model's documentation that reflect an expectation that the modified PRIM algorithm would be more efficient than the unmodified PRIM algorithm because "the modified [PRIM] algorithm leads to lower feeder cost estimates than the unmodified [PRIM] algorithm."[485]

178. Here, AT&T/WorldCom claim otherwise, arguing that the unmodified PRIM algorithm does a superior job of designing a lower-cost outside plant network configuration. AT&T/WorldCom have every incentive to propose an optimizing algorithm that best achieves its purpose of minimizing costs. If AT&T/WorldCom are wrong, and the modified PRIM algorithm better optimizes network design to minimize costs, then our selection of the unmodified algorithm would lead to an overstatement of costs. Consequently, we find it appropriate to use an objective optimizing algorithm proposed by the party with the greatest incentive to minimize costs.

179. Verizon's argument that the unmodified PRIM algorithm fails to account for all of the outside plant because it does not reflect how Verizon will actually add new SAIs/FDIs[486] misunderstands the point of an optimization algorithm. The purpose of the algorithm, whether modified or unmodified PRIM, is to design an outside plant (both feeder and distribution) network that connects customers to central offices in the most efficient manner. If full connectivity with appropriately sized cabling occurs, then either version of the algorithm functions correctly. As an abstract matter, on an individual wire center basis, the unmodified PRIM algorithm may generate either higher or lower costs than the modified PRIM algorithm, depending on the specific characteristics of the wire center. That neither version of the PRIM algorithm reflects how Verizon actually deploys its outside plant at present is relevant neither to the specific choice of PRIM algorithm, nor to general TELRIC modeling.

180. Verizon's comparison to MST distance calculations is similarly inapposite. As AT&T/WorldCom correctly state, either form of the PRIM algorithm applies a Steiner algorithm (that is, assumes junction points), rather than using an MST design.[487] By using junction points, which connect multiple SAIs/FDIs to each other and connect drop terminal nodes to SAIs/FDIs, instead of connecting each customer location directly to the next location, the Steiner algorithm adds considerable efficiency to the modeled network compared to one using an MST methodology.[488] Thus, the MST calculations may overstate costs. In addition, the PRIM algorithms use rectilinear distances rather than airline miles to map outside plant routes, which likely overestimates rather than underestimates route distances, and thereby overestimates outside plant costs.[489] Further, Verizon's comparison of its MST calculations to the MSM mismatches distance assumptions. The MSM

[485] AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 13.

[486] Verizon Initial Cost Brief at 147.

[487] AT&T/WorldCom Ex. 1, Attach. B at 12-13 n.19; AT&T/WorldCom Ex. 14, at 36.

[488] AT&T/WorldCom Ex. 1, Attach. B at 12-13 n.19; AT&T/WorldCom Ex. 14, at 36-37.

[489] *See* AT&T/WorldCom Ex. 14, at 36-39.

assumes the use of a 0.9 road factor (which AT&T/WorldCom propose, but we reject[490]), but Verizon uses a 1.0 road factor in performing its MST calculations. Verizon thus fails to offer a meaningful apples-to-apples comparison, and instead compares a network that assumes a ten percent reduction in outside plant distances, and therefore costs, against a network that includes no such assumption.[491]

b. Other Algorithm or Coding Changes

(i) Positions of the Parties

181. In addition to using the unmodified PRIM algorithm, AT&T/WorldCom modify the following algorithm or coding items: (1) the drop terminal dispersion locations, (2) the drop terminal orientation, (3) the customer lot size/configuration, (4) the residual line allocation, and (5) the possibility for microgrids to overlap.[492] According to AT&T/WorldCom, these changes are necessary to correct implementation errors in the SM.[493] For example, AT&T/WorldCom correct coding in the SM that erroneously locates some drop terminal placements outside of the microgrid to which they are assigned.[494] Although Verizon suggests that these algorithm and coding changes are inappropriate,[495] it offers no specific critique of any of the individual changes

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[490] As we explain *infra* in section IV(C)(2)(c)(ii), a road factor is a method of adjusting estimates of route distances to reflect that the use of road surrogate data to plot customer locations may not reflect the actual dispersion of customers on roads and the associated cable and structure costs. A road factor of less than 1.0 would be used if dispersion and cable and structure counts are overstated, and a factor of greater than 1.0 would be used if they are understated.

[491] In addition to the treatment of the road factor, the comparison of MST distance to MSM distribution distance is inappropriate because of the way that customer lines are treated as inputs to the MSM. In wire centers with a low telephone penetration rate and few residential locations having secondary lines, a fractional line count, which could be significantly less than one, is assigned to each residential location in the data set. When the MSM is run, the sum of the fractional lines is converted to an integer number of lines, which the model then plots in the appropriate microgrids. The number of residential locations may therefore be lower than the number of residential locations in the underlying data. The model only configures plant to this lower number of locations. In contrast, the MST computed by Verizon measures the distance required to reach each of the fractional customer locations, thereby including distances for attaching some residential customers who do not, according to the input data, have residential telephone service. For example, assuming the model input data reflect ten customer locations in a cluster and a fifty percent telephone penetration rate, the MSM converts the ten fractional (*i.e.*, one-half) lines into five lines and then plots these five locations and designs plant to run to these locations. The MST, on the other hand, would design plant to run to each of the ten locations.

[492] AT&T/WorldCom Ex. 23, Vol. 1 at 3-4; AT&T/WorldCom Ex. 1, at 9, Ex. D at 1-6, 8, Attach. 1-6; *see also* Verizon Initial Cost Brief at 147.

[493] AT&T/WorldCom Ex. 23, Vol. 1 at 3-5, Attach. C at 108; AT&T/WorldCom Ex. 1, at 9-10, Ex. D at 1-6, 8.

[494] AT&T/WorldCom Ex. 1, Ex. D at 1-2.

[495] Verizon Initial Cost Brief at 146.

made by AT&T/WorldCom.[496] Instead, Verizon argues that the Commission has not adopted most of these changes in recently released versions of the SM.[497]

(ii) Discussion

182. We find that the changes made by AT&T/WorldCom to the algorithms and computer code used in the SM are appropriate for modeling a state-specific forward-looking network and are well documented.[498] AT&T/WorldCom's decision to sponsor a model based on the Commission's SM does not mean that AT&T/WorldCom are precluded from proposing changes to that model. Indeed, in adopting the model for universal service purposes, the Commission suggested that it expected improvements to the model platform would be made on an ongoing basis.[499] In the instant case, AT&T/WorldCom contend that model algorithm and coding changes are necessary to correct certain minor flaws in the SM.[500] For example, making changes to ensure that drop terminal placements are located within the microgrid to which they are assigned improves the accuracy of the model in designing the outside plant configuration.[501] Indeed, the Bureau (on authority delegated by the Commission) has already adopted this specific algorithm coding change in more recently released versions of the SM.[502]

183. Verizon, moreover, offers no specific critique of the changes that AT&T/WorldCom make.[503] Verizon's claims in its brief that the Commission either: (1) previously rejected AT&T/WorldCom's proposals (a claim Verizon does not substantiate)[504] or (2) has yet to

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[496] *See* AT&T/WorldCom Ex. 14, at 52; Verizon Initial Cost Brief at 147.

[497] Verizon Initial Cost Brief at 147.

[498] *See* AT&T/WorldCom Ex. 23, Vol. I at 3-5, Attach. C at 108; AT&T/WorldCom Ex. 1, at 9, Ex. D at 1-6, 8, Attach. 1-6.

[499] *Platform Order*, 13 FCC Rcd at 21329, para. 13 ("[W]e expect that . . . on an ongoing basis, we will find opportunities to make technical improvements [to the model platform]. In such cases, we delegate to the Common Carrier Bureau the authority to make changes or direct that changes be made as necessary and appropriate to ensure that the platform of the federal mechanism operates as described in this Order.").

[500] AT&T/WorldCom Ex. 1, at 9-10.

[501] *Id.*, Attach. D at 1-2.

[502] *See Common Carrier Bureau Seeks Comment on Translation of Cost Model to Delphi Computer Language and Announces Posting of Updated Cost Model*, CC Docket No. 96-45, Public Notice, 16 FCC Rcd 12630 (CCB 2001); *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Order, 18 FCC Rcd 41 (WCB 2003); Verizon Ex. 146 (AT&T/WorldCom Response to VZ-VA 9-22); Verizon Initial Cost Brief at 147 n.151 and accompanying text; AT&T/WorldCom Ex. 1, at 9.

[503] *See* AT&T/WorldCom Ex. 14, at 52.

[504] Verizon Initial Cost Brief at 146.

incorporate them into its current beta version of the SM,[505] fail to provide us with any justification to reject the algorithm changes. Indeed, in its reply brief, the only algorithmic or coding change that Verizon identifies as having previously been rejected by the Commission is the PRIM algorithm, discussed above.[506] In contrast to Verizon's lack of specificity in its criticisms, AT&T/WorldCom provide reasonable explanations to support each of their algorithm changes.[507] Accordingly, we accept the AT&T/WorldCom algorithm and coding changes made to the loop module of the MSM.

2. Cost Inputs

a. Updating Cost Input Data

(i) Positions of the Parties

184. In sponsoring the MSM, AT&T/WorldCom propose to update certain data that the Commission adopted in the universal service *Inputs Order*.[508] AT&T/WorldCom use updated data to bring the model forward to reflect, to the extent possible, outside plant costs as of year-end 2002, the middle of their three year-study period.[509] Specifically, AT&T/WorldCom update the line counts, the road distance factor, the feeder structure costs, the DLC input costs, the ARMIS data that underlie the plant mix calculations, and ARMIS financial data that are used in the MSM to calculate outside plant costs.[510]

185. Verizon objects to what it characterizes as selective updating of input data by AT&T/WorldCom.[511] These objections fall into two categories. First, Verizon objects generally to AT&T/WorldCom updating only selected inputs,[512] each of which results in lower costs.[513] For instance, the AT&T/WorldCom proposals to use updated (and higher) line counts (*i.e.*, demand data) and updated ARMIS data that underlie plant mix calculations (which has the effect of reducing the percentage of expensive underground plant deployed) result in the MSM

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[505] Verizon Ex. 108, at 32-33.

[506] Verizon Reply Cost Brief at 135 n.128; *see also supra* section IV(C)(1)(a); AT&T/WorldCom Ex. 14, at 52.

[507] AT&T/WorldCom Ex. 23, Vol. 1 at 3-4; AT&T/WorldCom Ex. 1, at 9, Ex. C at 1-4, 6, 8, Ex. D at 1-6, 8, Attach. 1-6.

[508] AT&T/WorldCom Ex. 1, at 11-13.

[509] *See id.* at 11; AT&T/WorldCom Ex. 23, Vol. 1 at 5-6, Attach. C; AT&T/WorldCom Initial Cost Brief at 33.

[510] AT&T/WorldCom Ex. 1, at 11-13, 18-19; AT&T/WorldCom Ex. 23, Vol. 1 at 8-10, Attach. G; AT&T/WorldCom Initial Cost Brief at 34-36.

[511] Verizon Ex. 109, at 79-83.

[512] *Id.* at 83.

[513] *See* Verizon Ex. 109, at 79-81, 83; Verizon Ex. 108, at 26-33; Verizon Reply Cost Brief at 134-37.

generating loop costs significantly below those generated by the original SM.[514] Verizon estimates that AT&T/WorldCom's proposal to update line counts (the merits of which are addressed below[515]) reduces loop costs by $2.81 per loop per month.[516]

186. Second, Verizon objects to AT&T/WorldCom's proposal to update the line count data without also updating the customer location data.[517] Verizon argues that AT&T/WorldCom's use of projected 2002 line counts with 1997 customer location data causes a significant understatement of loop costs. As a result of this data mismatch, the MSM treats all line growth between 1997 and 2002 as additional (second) lines, producing unattainable economies of scale.[518]

187. Verizon does not propose updating input data to the MSM, except to the extent that Verizon proposes to use data from its cost study in the MSM. For example, in its re-run of the MSM, Verizon proposes to use the fill factors that it uses in the LCAM.[519] For inputs that AT&T/WorldCom do not update, Verizon does not propose specific updates either.

188. AT&T/WorldCom respond to Verizon's contention that it is inappropriate to update select inputs by noting that the Bureau has modified certain input data in the SM to determine universal service support. Specifically, the Bureau has updated line count data without also updating customer location data.[520]

(ii) Discussion

(a) Updating Input Data Generally

189. We find that AT&T/WorldCom may update certain input data without concurrently updating all input data. We reach this conclusion for several reasons. First, adoption of AT&T/WorldCom's proposed updates allows for the use of state-specific data in place of nationwide inputs. When the Commission adopted nationwide inputs in the universal service proceeding, it expressly cautioned that the use of state-specific data may be more

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[514] *See infra* sections IV(C)(2)(a)(ii), IV(C)(2)(b), IV(C)(2)(h).

[515] *See infra* sections IV(C)(2)(a)(ii)(b), IV(C)(2)(b).

[516] Verizon Ex. 108, at 28.

[517] Verizon Ex. 109, at 79-81, 83, 113-17; Verizon Ex. 108, at 29-31; Tr. at 4401-02; Verizon Initial Cost Brief at 154-55.

[518] Verizon Ex. 109, at 83, 116-17; Verizon Ex. 108, at 29-31; Tr. at 4401-02; Verizon Initial Cost Brief at 154-55.

[519] *See* Verizon Ex. 204 (MSM Re-run); *see also infra* section IV(C)(2)(g).

[520] AT&T/WorldCom Initial Cost Brief at 122-23 (citing *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Order and Order on Reconsideration, 16 RCC Rcd 22418 (CCB 2001) (*2002 Line Count Order*)); *see* also AT&T/WorldCom Ex. 14, at 60-62.

appropriate for use in determining UNE rates.[521] The purpose of this proceeding is to set UNE prices based on the forward-looking cost of providing those UNEs, thus Virginia-specific data are better suited to this purpose.

190. Second, both Verizon and AT&T/WorldCom propose cost inputs that reflect data of different vintages for different inputs, and both sides update only select inputs in their filings in the arbitration. Indeed, in its cost study, Verizon proposes using updated year 2000 line count data with customer location data from 1993-1995.[522] Similarly, in adopting loop cost inputs for use in the SM, the Commission used data of mixed vintages, including, for example, line count data from 1998, customer locations based on 1997 data applied to 1990 census block data, and DLC investment data from 1995-1998.

191. Third, almost all of the MSM inputs are based on publicly available data. Thus, either side could propose updated inputs without significant difficulty. Verizon had ample opportunity to submit updated data, based either on publicly available data or on its own proprietary data, but it did not do so.[523] Finally, to the extent that complementary data sets reflect different vintages, we analyze the particular data issue below.

(b) Line Count Data

192. We find, based on the options presented by the parties, that it is appropriate to use updated line count data, despite the lack of updated customer location data. Ideally, of course, AT&T/WorldCom would have provided both updated line count data and updated customer location data. Alternatively, Verizon could have submitted updated customer location data. Where, as here, two inputs are used in a single cost equation, we prefer to use recent data of uniform vintage. Neither side, however, submitted such data. Consequently, we must select one of the following options: (1) updated line count data (estimated year-end 2002 vintage) coupled with older customer location data (mid-1997 vintage data applied to 1990 census block data), or (2) older data for both cost inputs (1998 line count data and 1997/1990 customer location data). Between these two options, we adopt the former as more likely to produce forward-looking outside plant costs in Virginia.

193. The Bureau has resolved this exact issue – whether to update line count data without also updating customer location data – in this same manner twice in the context of calculating universal service support. Specifically, in determining support levels for 2001 and 2002, the Bureau issued two separate orders, each of which required the use of updated line

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[521] *Inputs Order*, 14 FCC Rcd at 20172, para. 32 ("it may not be appropriate to use nationwide values for other purposes, such as determining prices for unbundled network elements").

[522] Verizon Ex. 122, at 60; AT&T/WorldCom Ex. 15 (Baranowski Surrebuttal), at 5-6.

[523] AT&T/WorldCom in fact restated many of the inputs that Verizon proposed for its cost models. *See, e.g.*, AT&T/WorldCom Ex. 12, at 19-79, 94-95.

count data even though customer location data were not similarly updated.[524] In these orders, the Bureau concluded that line count data must be updated to reflect cost changes.[525] Static line counts would fail to reflect economies of scale properly, thus violating one of the Commission's forward-looking cost methodology requirements identified in the *Universal Service First Report and Order*.[526]

194. The Bureau also found that the concern that a mismatch between customer location data and line count data would understate costs was exaggerated.[527] The costs for additional lines added at existing locations are accounted for through the line count increase. For example, both the SM and the MSM model larger, more expensive cable sizes to accommodate larger line counts within a cluster. In the line count update orders, the Bureau noted that 72 percent and 65 percent, respectively, of the increase in residential lines nationwide were due to the installation of additional lines at existing locations.[528] The use of road surrogate data to determine customer locations, moreover, means that missing locations lying anywhere on the road network used to create surrogate locations would be reflected in the outside plant structure costs computed by the model. Structure costs would thus be underestimated only to the extent that new locations are along new roads.[529] Further, we note that, although updated line count data are readily available (and reported to the Commission quarterly by the National Exchange Carrier Association (NECA)), updated customer location data are not. This remains the case even after the release of year 2000 Census data because such data do not currently exist in a format that the Commission could use to update customer location data.

195. Finally, we note that Verizon updates line count data but not customer location data in proposing its cost studies. Verizon uses 2000 line count data along with customer

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[524] *2002 Line Count Order*, 16 FCC Rcd at 22418, 22420-22, paras. 1, 6-12; *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Order, 15 FCC Rcd 23960, 23964-66, paras. 1, 8-13 (CCB 2000) (*2001 Line Count Order*).

[525] *2002 Line Count Order*, 16 FCC Rcd at 22420-21, para. 7; *2001 Line Count Order*, 15 FCC Rcd at 23964, para. 9.

[526] *2002 Line Count Order*, 16 FCC Rcd at 22420-21, para. 7 (citing *Universal Service First Report and Order*, 12 FCC Rcd at 8915, para. 250(6) ("The cost study or model must estimate the cost of providing service for all businesses and households within a geographic region. This includes the provision of multi-line business services, special access, private lines, and multiple residential lines. Such inclusion of multi-line business services and multiple residential lines will permit the cost study or model to reflect the economies of scale associated with the provision of these services."); *2001 Line Count Order*, 15 FCC Rcd at 23964, para. 9 (citing same).

[527] *2002 Line Count Order*, 16 FCC Rcd at 22421-22, paras. 10-12; *2001 Line Count Order*, 15 FCC Rcd at 23965-66, paras. 12-13.

[528] *2002 Line Count Order*, 16 FCC Rcd at 22421-22, para. 11 n.26; *2001 Line Count Order*, 15 FCC Rcd at 22965, para. 12.

[529] *2002 Line Count Order*, 16 FCC Rcd at 22421-22, para. 11; *2001 Line Count Order*, 15 FCC Rcd at 23965-66, para. 13.

location data from 1993-1995.[530] Thus, Verizon appears to concede implicitly that it is not necessarily inappropriate to use a cost model that uses updated line count data, but not updated customer location data.

b. Loop Count Demand Data

196. Having determined that it is appropriate to consider updated line count data, we must now address the manner in which AT&T/WorldCom propose to determine this input data.

(i) Method for Updating to 2002

(a) Positions of the Parties

197. AT&T/WorldCom propose using an estimated year-end 2002 line count to calculate loop costs. AT&T/WorldCom start with the actual line count for Verizon for the year 2000, as reported by NECA, and then project a growth rate for 2001 and 2002. In so doing, they estimate what the line count would be in the middle of their three-year study period.[531] To project line count growth from year 2000 to 2002, AT&T/WorldCom analyze annual NECA line counts for Verizon from 1994 through 2000 to determine the annual line growth rate for each year. They then apply the average growth rate between 1994 and 2000 to the actual year 2000 line count to calculate an estimate for the 2002 line count.[532]

198. Verizon claims that AT&T/WorldCom's methodology for estimating 2002 line counts is flawed. Specifically, Verizon contends that AT&T/WorldCom ignore both more recent trends in line growth that show that growth is slowing, and factors used by incumbent LECs to develop demand forecasts.[533] Verizon states that the projected growth rates used by AT&T/WorldCom exceed the actual growth realized in 2000 and suggests that, if line counts are to be updated, the growth rates that Verizon experienced in 2000 represent more reasonable alternatives.[534]

(b) Discussion

199. We agree with Verizon that the better way of projecting a 2002 line count is to use

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[530] Verizon Ex. 122, at 60; AT&T/WorldCom Ex. 15, at 5-6.

[531] AT&T/WorldCom Ex. 1, at 11; AT&T/WorldCom Ex. 23, Vol. 1 at 5, Attach. D. In their post-hearing brief, AT&T/WorldCom mischaracterize their line count projections to be to mid-2002, instead of to year-end 2002. *See* AT&T/WorldCom Initial Cost Brief at 121-22.

[532] AT&T/WorldCom Ex. 23, Vol. 1 at 5, Attach. D.

[533] Verizon Ex. 109, at 113-18 (identifying factors such as local economic conditions, requests for building permits, community demographics, and "the life-cycle phase of services").

[534] *Id.* at 113-14.

the actual year 2000 growth rate instead of the 1994 to 2000 average growth rate proposed by AT&T/WorldCom. Although it may be appropriate as a statistical matter to analyze several years' worth of line growth data to determine a trend and then apply this trend to the most recent year's data, as applied here this approach raises several concerns. First, we question the inclusion by AT&T/WorldCom of line count data for two years before the enactment of the 1996 Act. The 1996 Act spurred the development of facilities-based competition, which affects Verizon's line growth, and AT&T/WorldCom did not account for this affect. Second, AT&T/WorldCom calculate an arithmetic average of the years 1994-2000, without attempting to weight growth in individual years in response to changing circumstances. We question whether it is appropriate to weight equally line growth data from the boom years immediately following the 1996 Act and from the year 2000. Indeed, as Verizon notes, line growth slowed considerably in 1999 and 2000 compared to earlier years,[535] and AT&T/WorldCom offer no evidence that the more recent trend would not continue through 2002. We find that the most recent data (*i.e.*, 2000) provide a better basis to predict line growth for the following two years (*i.e.*, 2001 and 2002). Accordingly, we adopt the Verizon proposal and generate projected year-end 2002 line counts by applying the year 2000 line growth rate to the year 2000 line count.[536]

(ii) Using DS-0 Equivalents to Account for DS-1s and DS-3s

(a) Introduction

200. Both the SM and the MSM use as inputs estimates of the number of DS-0 equivalent lines representing residential lines, switched business lines, and special access lines (the latter of which represent primarily DS-1 and DS-3 non-switched business lines).[537] The number of special access lines used by both models is based on the number of high capacity lines (*i.e.*, DS-1 and DS-3 lines) reported by incumbent LECs, in this case Verizon, to the Commission (as part of the ARMIS reporting) on a DS-0 equivalent basis.[538] To determine the number of DS-0 equivalent high capacity lines, the incumbent LECs calculate DS-0 equivalents on a per channel basis. Thus, each DS-1 is counted as 24 DS-0 equivalent channels, and each DS-3 is counted as 672 DS-0 equivalent channels.[539]

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[535] *See id.* at 114.

[536] To determine projected 2002 line counts by wire center, we (1) began with AT&T/WorldCom's proposed 2002 line counts by wire center; (2) reduced these amounts by the growth rates that AT&T/WorldCom applied for 2001 and 2002 to arrive at line counts for year-end 2000; and (3) applied the year 2000 growth rates that we adopt herein to the year 2000 line counts for years 2001 and 2002. We also verified that the year 2000 line counts, in aggregate, are the same as those that Verizon reported in its ARMIS filings.

[537] *See* AT&T/WorldCom Ex. 23, Vol. 1, Attach. D.

[538] *Inputs Order*, 14 FCC Rcd at 20202, para. 100.

[539] *See* ARMIS instructions, available on the Commission's web site at http://www.fcc.gov/wcb/armis/instructions/2002/definitions08.htm#T1Agen (visited Mar. 28, 2003).

201. Based on the line count inputs, including the high capacity DS-0 equivalent counts, the SM and the MSM construct the facilities needed to provide each kind of service. As an end result, the models compute a total cost for each wire center. Using the convention that all high capacity lines are counted in terms of their DS-0 equivalents, the models then calculate the average cost per line by dividing total cost by the number of DS-0 equivalent lines (equal to the sum of residential, switched business, and special access lines) resulting in a rate for a DS-0 equivalent line (*i.e.*, the basic two-wire loop).

202. The SM uses two additional inputs to determine the kind of facilities to build. It assumes that a fixed percentage (equal to 12.75 percent) of switched business lines are carried on either DS-1 or DS-3 facilities and that a different fixed percentage (equal to 91.75 percent) of special access lines are carried on either DS-1 or DS-3 facilities.[540] For all lines carried on DS-1 or DS-3 facilities, there is no change in the amount of fiber feeder capacity used, but the number of twisted copper pairs in both the feeder and distribution portions of the network is assumed to be equal to the number of DS-0 equivalent lines divided by 12 (because 2 pairs can carry 1.5 Mbps or up to 24 DS-0 circuits).[541]

(b) Positions of the Parties

203. As stated, the MSM incorporates high capacity lines through DS-0 equivalent line counts, which assume a 24:1 DS-0 to DS-1 ratio and a 672:1 DS-0 to DS-3 ratio. To determine the costs of DS-1 and DS-3 loops, AT&T/WorldCom propose using cost factors of 4.3:1 and 41.3:1 for DS-1 loops and DS-3 loops, respectively.[542] AT&T/WorldCom implicitly recognize that the use of DS-0 equivalent line counts based on channel capacity in combination with the SM's assumptions regarding the percentage of special access facilities may be inconsistent with the DS-1 and DS-3 cost factors they propose, and that this inconsistency could result in understating loop costs by spreading too few costs over too many DS-0 equivalent loops.[543]

204. To correct for any understatement of total costs, AT&T/WorldCom modify the default inputs of the SM by setting the percentages of switched business lines and special access lines carried on either DS-1 or DS-3 facilities to zero.[544] That is, when the MSM calculations are performed, the model never deploys any DS-1 or DS-3 facilities using the 12:1 line ratio. Instead, the model is instructed to configure the outside plant network such that all lines are

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[540] *See Inputs Order*, 14 FCC Rcd at 20202, para. 100.

[541] *See id.*

[542] As explained, *infra* section IV(D)(1)(c), we adopt the AT&T/WorldCom proposal.

[543] *See* AT&T/WorldCom Ex. 1, at 18, 20-21; AT&T/WorldCom Ex. 14, at 43-46; AT&T/WorldCom Ex. 23, Vol. 1 at 11-12.

[544] AT&T/WorldCom Ex. 1, at 11.

carried on two-wire analog circuits.[545] Thus, although the total number of DS-0 equivalent lines remains overstated, the total network costs are also overstated because the MSM deploys more copper pairs than are actually required.[546]

205. Verizon claims that using DS-0 equivalents to account for high capacity special access lines overstates the number of loops assumed in the network, thereby understating loop costs. Holding costs constant, as the number of loops increases, the cost per loop decreases. Verizon advocates the use of physical per line data, rather than DS-0 equivalents.[547] By not using physical per line data, Verizon contends that AT&T/WorldCom fail to allocate costs properly to DS-0 loops and assume unattainable network efficiencies and economies of scale.[548] If physical per line data are not used for high capacity special access lines, then Verizon alternatively proposes that special access DS-0 equivalents be removed from the MSM computations entirely.[549] All switched business lines should also be assumed to use DS-0 facilities. By making these changes to the MSM, the model would determine costs that reflect achievable economies of scale.[550]

206. To the extent that we accept use of DS-0 equivalents as representative of high capacity special access outside plant lines and costs, Verizon also criticizes AT&T/WorldCom's method of calculating the DS-0 equivalents. Specifically, Verizon claims that AT&T/WorldCom inflate the line counts by misinterpreting Verizon's year 2000 ARMIS data, and understate costs by failing to include investments necessary for DS-1 and DS-3 multiplexing equipment.[551]

207. AT&T/WorldCom admit that they initially misinterpreted the Verizon ARMIS data. They subsequently reduced the number of special access DS-0 equivalents by 700,000 to correct this error.[552] AT&T/WorldCom contend that Verizon's claim that using DS-0 equivalents rather than physical pairs understates costs is actually a matter of cost allocation. Use of DS-0 equivalents allocates more costs to high capacity lines relative to DS-0s than would the use of actual physical per line data. Thus, the use of DS-0 equivalents increases the costs associated with DS-1 and DS-3

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[545] *Id.* at 18; AT&T/WorldCom Ex. 23, Vol. 1 at 11-12.

[546] *See* AT&T/WorldCom Ex. 1, at 18, 25.

[547] *See* Verizon Ex. 109P (Murphy Rebuttal), at 35-37 (confidential version); Tr. at 4517-25.

[548] Verizon Ex. 109P, at 30-38 (confidential version); Verizon Ex. 108, at 29 n.20; Tr. 4395-96, 4487-92, 4517-25; Verizon Initial Cost Brief at 143-45.

[549] *See* Verizon Ex. 109, at 31; Verizon Ex. 162 (Tardiff Supplemental Rebuttal), at 3-6; Verizon Ex. 204; Tr. 4395-96, 4487-92, 4517-25.

[550] *See* Verizon Ex. 109P, at 29-38, 113-17 (confidential version); Verizon Ex. 204; Tr. 4395-96, 4487-92, 4517-25; Verizon Initial Cost Brief at 143-46.

[551] Verizon Ex. 109, at 37.

[552] AT&T/WorldCom Ex. 14, at 72; AT&T/WorldCom Initial Cost Brief at 122.

loops, which offsets any reduction in DS-0 loop costs. Total loop costs, however, are not affected.[553] Finally, AT&T/WorldCom claim that, by accounting for line cards and other costs that are necessary to deploy the number of DS-0 equivalent lines calculated, the model captures sufficient costs to account for DS-1 and DS-3 multiplexing investments.[554]

(c) Discussion

208. We find that counting high capacity (*i.e.*, DS-1 and DS-3) lines on a per channel DS-0 equivalent basis (*i.e.*, 24 DS-0s per DS-1 and 672 DS-0s per DS-3), when combined with the AT&T/WorldCom proposal to determine the cost of DS-1 and DS-3 loops based on different cost ratios (*i.e.*, 4.3:1 DS-1 to DS-0 and 41.3:1 DS-3 to DS-0), creates total cost and cost allocation problems that all but ensure that total outside plant costs are not recovered. Specifically, basing the costs for DS-1 and DS-3 loops in the DS-0 loop cost calculations on one DS-0 equivalency ratio, while basing the cost recovery mechanism for DS-1 and DS-3 loops on a different, lower DS-0 equivalency ratio, results in under-recovery of total outside plant costs.

209. AT&T/WorldCom's proposed solution fails to resolve the total cost and cost allocation problems. AT&T/WorldCom propose to offset overstating line counts, which result from the 24:1 and 672:1 DS-0 equivalent calculations for DS-1 and DS-3 loop facilities, respectively, by overstating the number of facilities on which DS-0 special access (and switched business) lines are carried. Specifically, AT&T/WorldCom propose to assume that DS-0 outside plant will be built to carry all special access (and switched business) lines, thereby overstating the outside plant costs for these lines.[555] They do not, however, offer evidence that the overstatement of costs offsets the overstatement of the DS-0 equivalent line count. Rather, this "two-wrongs-make-a-right" approach does not resolve the total cost problem (except, perhaps, by happenstance).[556]

210. Verizon proposes to address the total cost problem, as well as its allegation that the use of DS-0 equivalents to account for special access lines creates unachievable economies

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[553] *See* AT&T/WorldCom Ex. 14, at 44-47; AT&T/WorldCom Initial Cost Brief at 125.

[554] *See* AT&T/WorldCom Ex. 14, at 48-49.

[555] AT&T/WorldCom Ex. 1, at 18; AT&T/WorldCom Ex. 23, Vol. 1 at 11-12.

[556] We note that, had we accepted the AT&T/WorldCom approach to use DS-0 equivalent line counts for high capacity special access lines, two specific Verizon criticisms would fail to withstand scrutiny. First, AT&T/WorldCom correct their original faulty application of the number of special access lines in Verizon's year 2000 ARMIS data by lowering the number they use in their best and final offer from 2.8 million to 2.1 million. Keffer Dec. 12 Letter, Install A; AT&T/WorldCom Ex. 14, at 72-73. Second, as AT&T/WorldCom state, Verizon misinterprets the DS-0 equivalent calculations that AT&T/WorldCom perform by failing to recognize that AT&T/WorldCom include DLC costs associated with all DS-0 equivalent lines, which captures sufficient costs to account for DS-1 and DS-3 multiplexing investments. *See* AT&T/WorldCom Ex. 14, at 48-49.

of scale,[557] by zeroing out the DS-0 equivalent special access line counts and associated costs in the MSM.[558] We find that this approach, although not ideal, offers a solution consistent with the Commission's arbitration rules.[559] Therefore, we adopt the Verizon proposed solution.

211. In order to implement this proposal, the number of special access lines in each wire center is set equal to zero, with switched business and residential line counts remaining unchanged. In addition, we set the percentages of switched lines carried on DS-1 or DS-3 facilities equal to zero, as both Verizon and AT&T/WorldCom propose (albeit for different reasons).[560] Using the resulting cost estimate to determine the number of and rates for DS-0 lines, rates for DS-1 and DS-3 lines may then be determined using the now independent AT&T/WorldCom proposed DS-1 to DS-0 and DS-3 to DS-0 cost ratios (*i.e.*, 4.3:1 and 41.3:1, respectively). DS-1 and DS-3 loop rates may be based on these (or any other appropriate) cost ratios because the rates for these loops would no longer rely on DS-0 costs that already include high capacity loop costs. That is, using this convention to determine DS-0 loop costs resolves total cost issues between the DS-0 loop costs and the DS-1 and DS-3 loop costs by making the DS-0 loop cost determination independent of the DS-1 and DS-3 loop cost determination.

212. We adopt the Verizon proposed modification as a valid application of TELRIC principles. We acknowledge, however, that the rates computed according to this proposal represent an upper bound on the rates of the basic two-wire analog loop. Because two-wire loops and higher capacity loops share network facilities, the correct economic approach to pricing would be to assign to DS-0 loops their directly attributable incremental costs plus a share of the joint facilities costs of providing DS-0 loops and high capacity loops. The Verizon approach assigns to the DS-0 loops the full stand-alone cost of providing DS-0 loops, which is equal to the directly attributable incremental costs of DS-0 loops plus all of the joint facilities costs of all outside plant. By assigning all of the outside plant joint facilities costs to the DS-0 loop type, the basic 2-wire loop rates are within (but at one end of) the reasonable TELRIC range.

213. The Commission has repeatedly stated in its section 271 orders that the application of TELRIC principles can result in UNE rates that fall within a range of

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[557] Regarding Verizon's proposal to use physical per line data instead of DS-0 equivalent data, we note that no such data have been introduced into the record.

[558] Verizon Ex. 204.

[559] *See supra* section II(C) (discussing the baseball arbitration rules). An ideal solution might involve running the MSM multiple times in order to compute the incremental costs of both DS-0 lines and high capacity lines, as well as the total cost of providing all lines together in the network. Some "reasonable" allocation of the common costs, based on DS-0 equivalent lines or actual facilities could then be imposed. Because we have no record on how to effectuate such reasonable allocations of common costs among different loop types, we have no basis to implement such a solution in this proceeding.

[560] *See* Verizon Ex. 204.

reasonableness; that is, TELRIC does not mandate a specific rate, but rather is a methodology under which rates may result within a reasonable range.[561] Here, we are faced with two proposals for accounting for special access lines and their associated costs. AT&T/WorldCom's proposal would result only by chance in loop rates that fall within the range of reasonableness. Verizon's proposal, in contrast, falls within the reasonable TELRIC range. Accordingly, pursuant to the baseball arbitration rules,[562] we adopt Verizon's proposal because it is the only valid one before us.

(iii) Inclusion of All Wire Centers

(a) Positions of the Parties

214. Verizon criticizes the validity of the MSM because it excludes two Virginia wire centers – Centreville (CLLI code CNVIVACT) and McLean/Lewinsville (CLLI code MCLNVALV).[563] Verizon characterizes this flaw as an example of the inherent failure of the MSM to model UNEs properly.[564] Verizon makes no specific proposal to adjust the MSM to include these wire centers.

215. AT&T/WorldCom acknowledge that the MSM as originally submitted erroneously excluded these two wire centers.[565] During the course of the arbitration, AT&T/WorldCom corrected this problem, including both of these wire centers in their best and final offer submission.[566]

(b) Discussion

216. We find this issue to be moot. AT&T/WorldCom recognize that they failed to include two Verizon wire centers in their original cost model submission. They then corrected this error in their best and final offer submission. Inasmuch as AT&T/WorldCom respond fully to Verizon's criticism, no disagreement remains for us to resolve.

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[561] *See, e.g., Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act to Provide In-Region, InterLATA Service in the State of New York*, CC Docket No. 99-295, Memorandum Opinion and Order, 15 FCC Rcd 3953, 4084, para. 244 (1999) (*New York 271 Order*), *aff'd sub. nom. AT&T Corp. v. FCC*, 220 F.3d 607 (D.C. Cir. 2000).

[562] *See supra* section II(C).

[563] Verizon Ex. 163 (Murphy Supplemental Rebuttal), at 20-23; Verizon Initial Cost Brief at 146 n.149.

[564] Verizon Ex. 163, at 23.

[565] Tr. at 4429-30.

[566] *See* Keffer Dec. 12 Letter, Install A.

c. Customer Location Data

(i) Verifiability of Data

(a) Positions of the Parties

217. To model outside plant costs, a cost model must identify the locations of the end-user customers that are connected to the local network. AT&T/WorldCom use the same customer location data that the Commission used in the SM.[567] Verizon alleges that, because the customer location data utilized by the MSM is based on proprietary third-party (*i.e.*, Taylor Nelson Sofres (TNS)) information, the accuracy and reliability of the data cannot be tested.[568]

(b) Discussion

218. We reject Verizon's assertion and find instead that the AT&T/WorldCom customer location data are sufficiently verifiable for use in a TELRIC model. Although we generally prefer to rely on public rather than proprietary data, in the instant case, all parties had sufficient ability to review and comment on the proprietary-based data. In the *Inputs Order*, the Commission endorsed the use of the PNR (predecessor to TNS) road surrogate algorithm and the PNR methodology for estimating customer location data.[569] Verizon (through its predecessor entities Bell Atlantic and GTE) was able to and did comment on the use of PNR's algorithm and methodology to calculate customer location data.[570] The Commission responded to, and rejected, Verizon's claims there.[571] In particular, the Commission found that "interested parties have been given a reasonable opportunity to review and understand the National Access Line Model process [proposed by PNR] for developing customer counts."[572] Verizon, moreover, fails to propose any alternative source of customer location data for use in the MSM. Accordingly, the customer location data accepted by the Commission in the *Inputs Order* remain the best available source of customer location data, and we find it appropriate for use in the MSM.

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[567] AT&T/WorldCom Ex. 14, at 61.

[568] Verizon Ex. 109, at 118; Verizon Initial Cost Brief at 164.

[569] *Inputs Order*, 14 FCC Rcd at 20176-87, paras. 40-62.

[570] *Federal-State Joint Board on Universal Service*, CC Docket Nos. 96-45, 97-160, Bell Atlantic Inputs Further Notice Comments at 13-15 (filed July 23, 1999), GTE Inputs Further Notice Comments at 37-39 (filed July 23, 1999).

[571] *Inputs Order*, 14 FCC Rcd at 20178-80, 20182-86, paras. 45-47, 54-61 (rejecting Bell Atlantic and GTE criticisms of the PNR algorithm as unverifiable).

[572] *Id.* at 20185-86, para. 60.

(ii) Road Factor

(a) Introduction

219. The MSM, like the SM, uses road surrogate data to estimate customer locations because the more accurate customer geocoded data were not available.[573] In using road surrogate data, the model plots customer locations in each cluster at equal distances apart on the roads modeled. This may not reflect the actual dispersion of customers on roads.

220. A road factor could be used to adjust for any inaccuracies caused by the use of surrogate data. The factor would be less than 1.0 if dispersion and cable and structure counts were overstated and greater than 1.0 if they were understated. In the *Inputs Order*, the Commission rejected using a nationwide road factor of less than 1.0 because parties to the universal service proceeding failed to submit reliable data to verify that the use of road surrogate data overstated customer dispersion.[574]

(b) Positions of the Parties

221. AT&T/WorldCom propose a road factor of 0.9 to compensate for the overstated dispersion and cable and structure counts that result from the use of road layout based surrogate customer location data, as opposed to more accurate geocoded customer location data. AT&T/WorldCom support this change from the 1.0 road factor used in the SM by claiming that: (1) a newer BellSouth Telecommunications, Inc. (BellSouth) cost model based on actual geocoded data generates considerably fewer distribution route miles than does the SM, and (2) a comparison by the Kansas Corporation Commission of actual customer locations to surrogate customer locations showed that the route distances generated by the surrogate locations were fifteen percent too high.[575]

222. Verizon opposes the use of a road factor of less than 1.0. It argues that the Kansas study cited by AT&T/WorldCom is inapplicable because a road factor must be calculated on a state-specific basis.[576] AT&T/WorldCom fail to do so or even to provide any evidence of similarities between customer location data for wire centers in Kansas and in Virginia.[577] Had a study been performed that analyzed ARMIS sheath distances in Virginia, Verizon claims that it would have shown that the road factor should have been greater than 1.0.[578] Verizon, however, does not propose

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[573] *See id.* at 20172-87, paras. 33-62.

[574] *Id.* at 20194-95, paras. 80-82.

[575] AT&T/WorldCom Ex. 1, at 21-22; AT&T/WorldCom Ex. 14, at 59; AT&T/WorldCom Initial Cost Brief at 126-27; AT&T/WorldCom Reply Cost Brief at 49-50.

[576] Verizon Initial Cost Brief at 167; *see also* Verizon Ex. 109, at 103.

[577] *See* Verizon Ex. 109, at 102-03; Verizon Initial Cost Brief at 167-68.

[578] Verizon Ex. 109, at 102-03.

using a higher number, preferring instead to retain the 1.0 road factor. Similarly, Verizon contends that the BellSouth model cited by AT&T/WorldCom is an inappropriate basis on which to establish a Virginia road factor because it does not reflect conditions in Virginia.[579] Finally, Verizon notes that, in the *Inputs Order*, the Commission rejected AT&T/WorldCom's claim that a road factor was necessary to adjust for overstated dispersion and inflated amounts of cable and structure.[580]

223. AT&T/WorldCom criticize Verizon's contention that ARMIS sheath distance data should be used to determine the road factor, claiming that such data are not forward-looking because they are based on embedded plant and ignore the structure sharing that would occur between feeder and distribution plant in a reconstructed network.[581]

(c) Discussion

224. We adopt Verizon's proposal to use a road factor of 1.0. In the universal service proceedings, AT&T/WorldCom proposed, and the Commission rejected, the use of a road factor less than 1.0 due to allegedly overstated dispersion and inflated cable and structure amounts.[582] Although the Commission recognized then that the issues raised by AT&T/WorldCom might justify the application of a road factor less than 1.0, it declined to apply such a factor unless it was supported by specific evidence.[583] AT&T/WorldCom fail to provide any Virginia-specific evidence here. For example, although the Kansas decision cited by AT&T/WorldCom relies on a wire-center-by-wire-center analysis,[584] AT&T/WorldCom present no similar analysis for Virginia. Nor do they provide any evidence showing that wire centers in Virginia have characteristics similar to those in Kansas.[585] The BellSouth study cited by AT&T/WorldCom is similarly unavailing. AT&T/WorldCom did not submit the BellSouth study into evidence, thus it has not been reviewed in this proceeding. Although the Kansas Commission decision and the BellSouth cost study may support the reasonableness of Virginia-specific studies (had any been submitted), standing alone they provide insufficient support for AT&T/WorldCom's proposal.

225. Although Verizon suggests that an appropriate road factor would be greater than

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[579] Verizon Initial Cost Brief at 167; *see also* Verizon Ex. 109, at 102-03.

[580] Verizon Ex. 109, at 101-04; Verizon Initial Cost Brief at 167-68.

[581] AT&T/WorldCom Ex. 14, at 57-59; AT&T/WorldCom Ex. 18P (Riolo Surrebuttal), at 19-20 (confidential version); AT&T/WorldCom Initial Cost Brief at 127.

[582] *Inputs Order*, 14 FCC Rcd at 20178-79, 20195, paras. 45-46, 82.

[583] *Id.* at 20179, para. 46.

[584] *An Investigation into the Kansas Universal Service Fund (KUSF) Mechanism for the Purpose of Modifying the KUSF and Establishing a Cost-Based Fund*, Docket No. 99-FIMT-326-GIT, Order 16: Determining the Kansas-Specific Inputs to the FCC Cost Proxy Model to Establish a Cost-Based Kansas Universal Service Fund at paras. 32-33, 38 (Kansas Commission 1999) (*Kansas Commission USF Order*).

[585] *See* Verizon Ex. 109, at 102-03; Verizon Initial Cost Brief at 167.

1.0,[586] it neither proposes such a factor nor provides any evidence to support a higher figure. Rather, Verizon proposes use of the 1.0 factor adopted by the Commission in the *Inputs Order*.[587]

226. We therefore reject AT&T/WorldCom's proposed road factor of 0.9 in favor of the 1.0 factor proposed by Verizon and adopted by the Commission in the *Inputs Order*.

(iii) Vacant Residential and Business Units

(a) Positions of the Parties

227. Verizon claims that customer locations are undercounted by the MSM because the model fails to account for vacant residential and business units. Such units should be included because they represent planned growth, and any LEC (incumbent or competitive) building a network would build to all housing units, not just the ones then occupied.[588] Although Verizon provides some census figures pertaining to the percentage of housing units that were unoccupied in 2000,[589] it does not propose any specific adjustment to the MSM.

228. AT&T/WorldCom contend that the MSM does not undercount customer locations by failing to account for vacant residential and business units.[590] Rather, the Commission explicitly chose to use data based on households rather than housing units in calculating the number of customer locations in the original SM.[591]

(b) Discussion

229. We agree with AT&T/WorldCom that it is appropriate to base customer locations in the MSM on the number of households rather than on the number of housing units. The Commission expressly addressed this issue in the *Inputs Order* and chose to base customer location data on the number of households rather than on the number of housing units in order to achieve consistency in its calculations by avoiding the use of mismatched data.[592] Specifically, the Commission found that vacant units must either be included in both the line count data and the customer location data or in neither. Because line count data, in turn, uses household rather than housing unit data, the Commission found that household data must also be used to determine

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[586] Verizon Ex. 109, at 103.

[587] *See* Verizon Initial Cost Brief at 167-68.

[588] Verizon Ex. 109, at 23; Verizon Initial Cost Brief at 164-65.

[589] *See* Verizon Ex. 109, at 23.

[590] *See* AT&T/WorldCom Ex. 14, at 42-43; AT&T/WorldCom Initial Cost Brief at 145-46 n.135.

[591] AT&T/WorldCom Initial Cost Brief at 145-46 n.135 (citing *Inputs Order*, 14 FCC Rcd at 20183-84, paras. 56-57).

[592] *Inputs Order*, 14 FCC Rcd at 20183-84, paras. 56-57.

customer locations.[593] To use housing units (including vacant units) to determine customer locations would result in inflated line costs due to a data mismatch. Indeed, the Commission specifically found that "adopting housing units as the standard would inflate the cost per line by using the highest possible numerator (all occupied and unoccupied housing units) and dividing by the lowest possible denominator (the number of customers with telephones)."[594] Maintaining consistency in this calculation remains as important here as it was in the universal service proceeding.[595] Thus, because households rather than housing units are used to determine loop counts, households should also be used to determine customer locations.[596] We therefore reject Verizon's proposal to include vacant units in the customer location data only.

d. Cable Drop Length

(i) Positions of the Parties

230. Verizon claims that the drop length used in the MSM is too low and improperly calculated.[597] Specifically, it claims that the MSM uses an inappropriately short drop length of approximately 24 or 27 feet,[598] much shorter than the national average drop length of 73 feet.[599] Verizon largely attributes this error to AT&T/WorldCom's calculation of drop length using the number of drops, rather than the number of lines.[600] Verizon also asserts that the small drop length derives from AT&T/WorldCom's use of an improper road factor and an excessive loop count.[601]

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593 *Id.*

594 *Id.* at 20184, para. 57.

595 The issue of maintaining consistency between data points here is noticeably different from the data mismatch issue we address between line count data and customer location data. *See supra* section IV(C)(2)(a)(ii)(b). Here, the AT&T/WorldCom proposal properly matches both data type (*e.g.*, household v. housing unit) and vintage (*i.e.*, year). Verizon proposes, in concept, that we should mismatch the type of data. In addressing the line count and customer location data issue, we resolved issues of data vintage, not data type. We also found that the possible mismatch is overstated because many new customers will be located at existing customer locations or along modeled plant routes. *See id.* The Bureau, moreover, twice endorsed this approach to line count and customer location data, whereas the Commission expressly determined that no mismatch should exist in the type of data addressed here. *Compare 2002 Line Count Order*, 16 FCC Rcd at 22418, 22420-22, paras. 1, 7-12 *and 2001 Line Count Order*, 15 FCC Rcd 23960, 23964-66, paras. 1, 9-13, *with Inputs Order*, 14 FCC Rcd at 20184-85, para 57.

596 We also note that Verizon does not offer any explanation as to why any undercount in vacant units is not accounted for through the application of fill factors. *See infra* section IV(C)(2)(g).

597 Verizon Ex. 109, at 104-07; Verizon Reply Cost Brief at 158.

598 *Compare* Verizon Ex. 109, at 105 (23.8 feet), *with* Verizon Reply Cost Brief at 157-58 (27.3 feet).

599 Verizon Ex. 109, at 105 (citation omitted); Verizon Reply Cost Brief at 158.

600 Verizon Reply Cost Brief at 158.

601 Verizon Ex. 109, at 104-07; Verizon Reply Cost Brief at 158.

231. AT&T/WorldCom assert that Verizon's criticisms are misplaced. Cable drop lengths should be calculated based on the number of drops, not the number of lines. When properly calculated, the drop length is 77.4 feet, not the 24 or 27 feet that Verizon alleges and longer than the 73 feet that Verizon claims would be appropriate.[602]

(ii) Discussion

232. We agree with AT&T/WorldCom. Drop lengths represent the cable length between the customer location and the drop (*e.g.*, pole, pedestal). Drop lengths should be calculated based on the number of drops, as AT&T/WorldCom propose, not the number of lines.[603] AT&T/WorldCom, moreover, demonstrate that the drop length they use in the MSM is actually longer than the drop length that Verizon proposes as a reasonable alternative.[604]

e. Distribution Length and Engineering Standards for Sizing Distribution Areas

(i) Positions of the Parties

233. Once customer locations have been identified, they must be grouped by the cost model in an efficient and technologically reasonable manner.[605] Two possible ways to group customer locations are use of a clustering algorithm or a grid-based approach.[606] A clustering algorithm uses a multifaceted approach, including the use of internal optimization algorithms, to group locations in proximity to one another into clusters in a manner designed to minimize costs while maintaining a specified level of service quality.[607] Accordingly, in the *Platform Order*, the Commission found the use of a clustering algorithm "consistent with actual, efficient network design."[608] A grid-based approach, as the term suggests, involves grouping customer locations by placing a uniform grid over the area being modeled and grouping together locations that fall within a grid.[609] In comparing these two approaches, the Commission found that, although the grid-based approach is simpler to implement, the use of the clustering algorithm was superior because it identifies "natural groupings of customers . . . does not impose arbitrary serving area boundaries" as

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602 AT&T/WorldCom Ex. 14, at 39-40; AT&T/WorldCom Initial Cost Brief at 184.

603 We address issues raised by Verizon pertaining to the road factor and to the loop count *supra* in sections IV(C)(2)(d)(ii) and IV(C)(2)(b), respectively.

604 *See* AT&T/WorldCom Ex. 14, at 39-40; AT&T/WorldCom Initial Cost Brief at 184.

605 *Platform Order*, 13 FCC Rcd at 21341, para. 42; AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 4-5.

606 *See Platform Order*, 13 FCC Rcd at 21341-42, para. 43.

607 *Id.* at 21341-45, paras. 43-53; AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 4-16.

608 *Platform Order*, 13 FCC Rcd at 21342, para. 44.

609 *Id.* at 21342-43, para. 46.

does a grid-based approach, and takes into account engineering constraints such as distance limitations between customer locations and DLC systems.[610]

234. AT&T/WorldCom use the same clustering algorithm in the MSM that the Commission adopted in the SM.[611] In applying this algorithm, the MSM assumes a relatively small number of relatively large clusters, thereby lowering fixed costs while increasing variable (*i.e.*, cable and structure) costs.[612] AT&T/WorldCom also claim that the appropriate copper/fiber break point in the clustering algorithm should be 18,000 feet.[613]

235. Verizon claims that the MSM improperly builds too few DAs with excessively long distribution lengths,[614] and that it fails to follow Carrier Serving Area (CSA) rules, which specify a copper/fiber break point of 12,000 feet.[615] Verizon also contends that the MSM improperly assumes that the number of clusters should be kept small as opposed to minimizing the distribution length per cluster.[616] Finally, Verizon asserts that the MSM routinely models clusters that violate the deployment guideline (different from the CSA rules) that DAs should have between 200 and 600 lines.[617] Verizon claims that, as a result of these errors, the MSM models approximately half of the DAs that actually exist in Verizon's network in Virginia.[618]

236. In response to these criticisms, AT&T/WorldCom claim that Verizon's LCAM model suffers the same infirmities that Verizon identifies in the MSM. Specifically, AT&T/WorldCom allege that the LCAM includes almost 2,500 fewer DAs than does Verizon's actual network in Virginia and that more than twenty percent of the DAs included in the LCAM contain more than 600 working lines.[619] The 200-600 working lines assumption for sizing DAs, moreover, represents a flexible engineering guideline, not a mandatory outside plant design rule.[620]

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[610] *Id.* at 21342-43, 21345, paras. 45-46, 53.

[611] *See* AT&T/WorldCom Ex. 1, at 1, 6-8; AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 4-16.

[612] AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 5-7.

[613] AT&T/WorldCom Ex. 18 (Riolo Surrebuttal), at 2-5; AT&T/WorldCom Initial Cost Brief at 127-30; AT&T/WorldCom Reply Cost Brief at 50.

[614] Verizon Ex. 109, at 20-22, 24-25, 27-28; Verizon Initial Cost Brief at 166; Verizon Reply Cost Brief at 143-44.

[615] Verizon Ex. 109, at 19-22, Attach. 2; Verizon Initial Cost Brief at 166; Verizon Reply Cost Brief at 142-43.

[616] Verizon Ex. 109, at 24; Verizon Reply Cost Brief at 143-44.

[617] Verizon Ex. 109, at 20-22; Verizon Reply Cost Brief at 143-44.

[618] Verizon Ex. 109, at 20-22; Verizon Reply Cost Brief at 143-44.

[619] AT&T/WorldCom Ex. 15, at 3-4.

[620] AT&T/WorldCom Ex. 18, at 6.

(ii) Discussion

237. We agree with AT&T/WorldCom and find that the MSM does not improperly size DAs.[621] AT&T/WorldCom persuasively demonstrate that DAs need not always contain between 200 and 600 working lines. Rather, these are general deployment goals.[622] Verizon claims that the Commission limited use of the clustering algorithm of the SM to rural areas and that there is no evidence that the algorithm produces overall efficient results.[623] Moreover, Verizon claims that AT&T/WorldCom misstate the Commission's findings in the *Platform Order*. The SM's documentation, however, notes that the clustering algorithm, which produces a smaller number of larger clusters, will perform better in rural areas than a clustering algorithm focused on generating a larger number of smaller clusters, but that "it is not clear, *a priori*, what number of clusters will embody an optimal trade-off between these fixed and variable costs."[624] The Commission applied optimization routines to its clustering algorithm to reduce the total distance between the customer locations and their clusters' centers by ten to thirty percent, typically.[625] Thus, the Commission found that the SM's clustering algorithm, which is used by the MSM, "provides the least-cost, most-efficient method of grouping customers into serving areas."[626] Accordingly, we find appropriate the use of this clustering algorithm in the MSM.

f. Engineering Standards for Copper Loop Lengths

(i) Positions of the Parties

238. AT&T/WorldCom assign a maximum copper/fiber breakpoint of 18,000 feet in the MSM.[627] They claim that this is consistent with modern CSA outside plant design guidelines and that the Commission endorsed the use of an 18,000 foot break point in the *Platform Order*.[628]

239. Verizon claims that the proper break point should be 12,000 feet and that this

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[621] We discuss the copper/fiber break point issue *infra* in section IV(C)(2)(f). Because we agree with Verizon on that issue, our finding on that issue will affect the average distributions length by reconfiguring in the MSM any loops that originally were determined to have distribution lengths of between 12,000 and 18,000 feet.

[622] AT&T/WorldCom Ex. 15, at 3-4.

[623] Verizon Reply Cost Brief at 144 n. 139.

[624] AT&T/WorldCom Ex. 23, Vol. 1, Attach. B at 5 (emphasis in original).

[625] *Id.*, Vol. 1, Attach. B at 6.

[626] *Platform Order*, 13 FCC Rcd at 21345, para. 53.

[627] AT&T/WorldCom Ex. 18, at 2-5; AT&T/WorldCom Initial Cost Brief at 127-30; AT&T/WorldCom Reply Cost Brief at 50.

[628] AT&T/WorldCom Ex. 14, at 33 (citing *Platform Order*, 13 FCC Rcd at 21352-53, para. 70); AT&T/WorldCom Ex. 18, at 3 (citing same).

limitation is required generally under the CSA guidelines. In particular, the 12,000 foot limit is necessary for a network to provide advanced services and network elements that were not at issue in the universal service proceedings. By using 18,000 feet in the *Platform Order*, Verizon alleges that the Commission departed from CSA guidelines.[629]

240. AT&T/WorldCom respond that the choice of an 18,000 foot or a 12,000 foot break point in the MSM is largely meaningless because fewer than one percent of loops modeled in the MSM have a break point of between 12,000 and 18,000 feet.[630]

(ii) Discussion

241. We agree with Verizon and find that the appropriate copper/fiber break point for use in the MSM is 12,000 feet. CSA guidelines expressly call for a copper/fiber break point at 12,000 feet, not 18,000 feet.[631] The CSA guidelines, although flexible enough to permit some exceptions, are nonetheless the most recent guidelines for building outside plant and, therefore, represent the most appropriate design guidelines to be used in a TELRIC model. Although AT&T/WorldCom note that the Commission used an 18,000 foot break point in the SM,[632] this is not dispositive here. Rather, Verizon is correct that the Commission made that decision in the context of modeling a network designed to provide a basic level of voice service to be supported.[633] Specifically, the Commission found that a design standard that included transmission standards applicable for voice, data, video, sensor control, and other uses exceeded the service quality standards for universal service. The Commission further found that it was not in the public interest to burden the universal service support mechanisms with the costs necessary to support a network capable of delivering very advanced services. Because such a limited network was being modeled, the Commission found an 18,000 feet break point appropriate.[634]

242. This is a different case. Unlike in the universal service context, the functionality of an unbundled loop is not limited to voice-grade service.[635] Thus, the universe of UNE loops included in the loop cost model is broader than the loops in the network modeled only for universal service purposes. When including this broader universe of loops, we conclude that the loop cost model should design outside plant that adheres to CSA guidelines. We therefore apply a

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[629] Verizon Ex. 109, at 19-22, Attach. 2; Verizon Initial Cost Brief at 166; Verizon Reply Cost Brief at 142-43.

[630] AT&T/WorldCom Ex. 14, at 32.

[631] AT&T Ex. 122 (Telcordia Notes on the Network, Section 12), § 12.1.4.

[632] *See* AT&T/WorldCom Ex. 14, at 33 (citing *Platform Order*, 13 FCC Rcd at 21352-53, para. 70); AT&T/WorldCom Ex. 18, at 3 (citing same).

[633] Verizon Ex. 109, at 19, 21; Verizon Reply Cost Brief at 142-43.

[634] *Platform Order*, 13 FCC Rcd at 21352-53, para. 70.

[635] 47 C.F.R. § 51.319(a)(1).

copper/fiber break point of 12,000 feet in the MSM.

g. Fill Factors

(i) Purpose and Use in Cost Models

243. Fill factors represent the percentage of total usable capacity of a part of outside plant (*e.g.*, distribution cable, copper feeder cable) that is expected to be used to meet a measure of demand.[636] Fill factors are used in designing outside plant to ensure that the plant can accommodate existing demand, growth, churn, and administrative functions (such as testing and repair), but also to avoid building excess capacity.[637] In developing a cost model, fill factors that are too low model an outside plant network with excess capacity above that of an efficient firm, thereby leading to inappropriately high UNE loop rates. Conversely, if fill factors are too high, the outside plant designed would be insufficient to support predicted growth and service outages, and the resulting UNE loop rates would be correspondingly too low.[638] In its section 271 orders, the Commission has accepted a wide range of fill factors as consistent with TELRIC principles.[639] Here, consistent with baseball arbitration rules,[640] we adopt the fill factors proposed by one side that are most consistent with Commission rules and precedent.

(a) Positions of the Parties

244. AT&T/WorldCom and Verizon employ different types of fill factors in their respective cost models. AT&T/WorldCom use target fill factors in the MSM, which are designed to approximate the excess capacity a firm would deploy to account for growth, churn, and administrative services over a reasonably foreseeable period of time. Thus, AT&T/WorldCom's proposed fill factors, which vary in the MSM for different parts of outside plant (*e.g.*, distribution, copper feeder, fiber feeder) and for density zones, are intended to ensure that the network models not only the capacity needed to provide service to current customers, but sufficient capacity to provide

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[636] Fill factors are sometimes referred to as utilization factors or utilization rates. *See* Verizon Ex. 109, at 84.

[637] *See Inputs Order*, 14 FCC Rcd at 20237-38, para. 186.

[638] *Id.*

[639] *See, e.g., Joint Application by BellSouth Corporation, BellSouth Telecommunications, Inc., and BellSouth Long Distance for Provision of In-Region, InterLATA Services in Georgia and Louisiana*, CC Docket No. 02-35, Memorandum Opinion and Order, 17 FCC Rcd 9018, 6053, 9054-55, paras. 66, 70 (2002) (allowed use of 69.5 percent for copper feeder, 74 percent for fiber feeder, and 48 percent for distribution as not clear TELRIC error) (*Georgia/Louisiana 271 Order*); *Kansas/Oklahoma 271 Order*, 16 FCC Rcd at 6275-76, para. 80 (30 percent distribution fill factor violates TELRIC as too low); *Application of Verizon New England Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions) and Verizon Global Networks Inc., for Authorization to Provide In-Region, InterLATA Services in Massachusetts*, CC Docket 01-9, Memorandum Opinion and Order, 16 FCC Rcd 8988, 9007-08, paras. 39-40 (2001) (*Massachusetts 271 Order*) (40 percent distribution fill factor may be too low).

[640] *See supra* section II(C).

for growth, churn, and administrative functions as well.[641] In so doing, AT&T/WorldCom rely on current demand, as opposed to ultimate demand (*i.e.*, the total anticipated future demand).[642] Thus, the fill factors drive the engineering used to model the network capacity.

245. This is the same approach to fill factors that the Commission adopted in the *Inputs Order*, and, for the factors adopted in the *Inputs Order* – distribution, copper feeder, and fiber feeder – AT&T/WorldCom propose using the same fill factors.[643] For remote terminal (RT) plug-in equipment and RT common electronics, AT&T/WorldCom propose using the same fill factors that the Commission adopted for copper feeder in the *Inputs Order*.[644]

246. Verizon does not use target fill factors in its loop cost study. Rather, it uses a capacity modeling approach based on realized (or actual) fill factors.[645] Verizon's engineering guidelines specify that the network should be built to support a certain level of capacity (generally, two lines per customer location). Verizon then applies a fill factor on top of this amount for cost study purposes. In so doing, Verizon applies its fill factor to ultimate demand – total demand for which the network is built – rather than to current demand. In other words, Verizon does not use fill factors to size facilities or otherwise plan the network. Instead, it applies fill factors to the network it will build in order to ensure that "the rates spread the forward-looking costs across only those units of capacity that will be available to produce revenue."[646] Verizon claims that it is being conservative in advocating use of its actual experienced fill factors, in both its cost study and the MSM, because the average fill factor in the competitive environment assumed under TELRIC would be less than its current actual fill due to increased fluctuations in demand and customer churn.[647]

(b) Discussion

247. As we explain in more detail below in the analyses of the individual fill factors, we adopt the fill factors proposed by AT&T/WorldCom. Their proposals comport with the Commission's treatment of fill factors in the *Inputs Order*, in both concept and level.[648] In that order, the Commission expressly adopted use of current demand, rather than ultimate demand, in applying fill factors. Moreover, the Commission rejected GTE's claims, raised again by Verizon

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641 *See* AT&T/WorldCom Initial Cost Brief at 145; *see also* Verizon Ex. 109, at 84.

642 *See Inputs Order*, 14 FCC Rcd at 20239, para. 188 (discussing ultimate demand).

643 *See* AT&T/WorldCom Initial Cost Brief at 151, 157, 160.

644 *See* AT&T/WorldCom Initial Cost Brief at 162-63.

645 Verizon Ex. 107P, at 34-40, 100-16 (confidential version); Verizon Initial Cost Brief at 103-05.

646 *See* Verizon Initial Cost Brief at 103.

647 *See id.* at 105.

648 *See Inputs Order*, 14 FCC Rcd at 20237-38, 20243-44, paras. 186, 200-01.