Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
	)	
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs	)	CC Docket No. 97-160

FURTHER NOTICE OF PROPOSED RULEMAKING

Adopted: July 18, 1997 Released: July 18, 1997

Comment Dates:
III.C.3 & 4 platform - August 8, 1997
III.C.1 platform - September 2, 1997
III.C.2 platform - September 24, 1997
III.C.5, 7, 8 & III.D platform - October 17, 1997
III.B.3 & III.C all inputs - October 17, 1997
IV and V - October 17, 1997

Reply Comment Dates:
III.C.3 & 4 platform - August 18, 1997
III.C.1 platform - September 10, 1997
III.C.2 platform - October 3, 1997
III.C.5, 7, 8 & III.D platform - October 27, 1997
III.B.3 & III.C all inputs - October 27, 1997
IV and V - October 27, 1997

By the Commission:

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I. INTRODUCTION

1. In our May 1997 Report and Order on Universal Service[1] we adopted a plan for establishing universal service support mechanisms for rural, insular, and high cost areas that will replace the current patchwork of implicit subsidies with explicit support based on the forward-looking economic cost[2] of providing supported services. We adopted a forward-looking

[1] Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Report and Order*, FCC 97-157 (rel. May 8, 1997) (Order).

[2] Order at para. 223-31.

economic cost methodology that will calculate universal service support for non-rural[3] local exchange carriers (LECs) in four steps.[4] For non-rural LECs, we adopted a forward-looking economic cost methodology that calculates universal service support in four steps. First, we will estimate the forward-looking economic costs of providing universal service in rural, insular, and high cost areas.[5] Second, we established a nationwide revenue benchmark calculated on the basis of average revenue per line.[6] Third, we will calculate the difference between the forward-looking economic cost and the benchmark.[7] Fourth, federal support will be 25 percent of that difference, corresponding to the percentage of loop costs allocated to the interstate jurisdiction.[8] We further decided to use forward-looking economic cost studies conducted by state commissions that choose to submit such cost studies to determine universal service support for their states.[9] We asked states to elect to conduct such studies by August 15, 1997 and to submit such studies by February 6, 1998.[10] When a state elects not to conduct such a study, we decided to determine the forward-looking economic cost of providing universal service in that state according to a forward-looking economic cost mechanism adopted by the Commission, with assistance from the Federal-State Joint Board on Universal Service (Joint Board).[11] In this Further Notice of Proposed Rulemaking (FNPRM) we seek comment on the specific mechanisms the Commission should adopt to calculate for non-rural carriers the forward-looking

[3] Non-rural carriers are carriers that do not meet the definition of rural carriers. We define "rural" as those carriers that meet the statutory definition of a "rural telephone company" set forth at 47 U.S.C. § 153(37). For example, LECs with fewer than 100,000 access lines are "rural" according to the statutory definition. 47 U.S.C. § 153(37)(C).

[4] A proceeding to evaluate forward-looking economic cost mechanisms for rural carriers will commence by October 1998. Order at para. 252. The Order established new universal service support mechanisms for rural carriers that essentially maintain the high cost loop support, DEM weighting, and Long-Term Support (LTS) programs of the old universal service mechanisms. *See* Order at paras. 291-313.

[5] Order at para. 223-51.

[6] Order at para. 200, 257-67.

[7] Order at para. 200, 257-67.

[8] Order at para. 201, 268-72. In the Order, the Commission stated that it will continue to consult with states to determine whether additional federal universal service support will be necessary to ensure that rates are "just, reasonable, and affordable." *See* Order at paras. 223, 271-272.

[9] Order at para. 248-49.

[10] Order at para. 248.

[11] Order at para. 206.

economic cost of providing supported services in states that elect not to submit cost studies.[12] In a separate proceeding, we also intend to consider the use of competitive bidding as a mechanism for determining universal service support levels.

2. In particular, in this FNPRM, we seek further comment on the mechanism we should adopt to estimate the forward-looking economic costs that non-rural LECs would incur to provide universal service in rural, insular, and high cost areas (hereinafter "the selected mechanism"). Specifically, we seek further comment on the platform design and input values we should adopt in the selected mechanism to estimate the cost of each of the elements of the telephone network necessary for non-rural LECs to provide universal service to high cost areas. In addition, we seek comment on the level of local usage included in the definition of universal service.

3. In the Order, we decided that non-rural carriers serving Alaska and insular areas should move to a forward-looking economic cost mechanism at the same time as other non-rural carriers.[13] We are presently aware of two companies serving Alaska and insular areas, Anchorage Telephone Utility (Anchorage Tel. Util.) and Puerto Rico Telephone Company (PRTC), respectively, that are non-rural carriers.[14] We recognize, however, that most carriers in insular areas qualify as rural telephone companies under the Act and will therefore receive support under the methodology established for rural carriers in the Order.[15] Although we acknowledged that carriers serving Alaska and insular areas may have higher costs due to extreme terrain and weather conditions, we found that large carriers should possess economies of scale and scope to deal efficiently with the cost of providing service in their areas.[16]

4. In the Order, we also observed that the models submitted in the proceeding did not include any information on Alaska or the insular areas.[17] We stated our expectation,

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[12] The Commission, by January 1, 1998, will consider in a separate proceeding how we should identify primary residential connections for determining the interstate subscriber line charge (SLC) and the primary interexchange carrier charge (PICC).

[13] Order at para. 315.

[14] PRTC is the twelfth largest telephone company, including holding companies, as measured by access lines, in the United States with 1,135,679 access lines and operating revenues of approximately $1 billion in 1995. USTA, Statistics of the Local Exchange Carriers (1996) at 5, 24. Anchorage Tel. Util. is the twenty-first largest telephone company, including holding companies, as measured by access lines, in the United States with 148,017 access lines and operating revenues of approximately $102 million in 1995. *Id.* at 5, 40.

[15] Order at 314.

[16] Order at para. 171.

[17] Order at para. 317.

however, that future versions of the models would include information for non-rural carriers serving Alaska and insular areas and also encouraged the utilities regulators in Alaska and the insular areas to submit a state cost study to the Commission.[18] We specifically request that, in response to this FNPRM, parties provide information about the input values or model design features that would allow the mechanism we develop in this proceeding to determine support for non-rural carriers in Alaska and the insular areas. Parties are requested to consider non-rural LECs in Alaska and the insular areas in their responses to all model-related questions in the FNPRM.

5. Based on recommendations of the Joint Board and subsequent state reports and comments, we have already reached many conclusions regarding the forward-looking mechanism we will use to determine support for non-rural carriers. In this FNPRM, we identify for public comment the remaining issues that the Commission must evaluate in order to adopt a mechanism to be used as part of the January 1999 methodology that will send the correct signals for entry, investment, and innovation. We seek to develop a record to resolve the differences between the forward-looking economic cost models that commenters have proposed in earlier filings, encouraging both models to converge and move towards assumptions and outputs that the Commission believes accurately reflect forward-looking economic costs.[19] We establish a series of comment and reply comment deadlines for various aspects of the models that will serve as a workplan for the model proponents, the public, the states, and Commission staff. This staged workplan will allow all parties to consider critical issues at the same time, and will encourage the public dialogue to progress in an orderly fashion. We intend that, during the comment and reply comment period for a given set of issues, the model proponents, the general public, the states, and the Commission staff will focus on those issues, thereby maximizing all parties' resources. Prior to and during the initial comment and reply comment periods, we also intend to hold public workshops on particular model components.

6. Shortly after each reply comment period on a group of issues has closed, the Bureau staff will issue, on authority delegated by the Commission, a decision about those issues that will take into consideration the proposals presented in the filed comments, including input from the states. We encourage model proponents to make refinements to their models promptly in accordance with the decisions of the Bureau staff in order for that model to continue to be considered as a candidate to become the January 1999 methodology. We anticipate that this staged workplan, including the Bureau decisions, will facilitate coordination with states that elect to develop cost studies for federal universal service support. We also intend this workplan to complement proceedings implementing states' universal service support programs.

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[18] Order at para. 317.

[19] For a discussion of the forward-looking economic cost models submitted to the Commission in 1996, *see infra* section III.

7. As a result of cooperative work among the Commission staff, the model proponents, the states, and the public, we expect that the similarities between the models will increase throughout the staged process in this proceeding until the platform designs of the model converge. In the alternative, we anticipate that one of the models, or a hybrid comprised of the best features of both models, will be sufficiently developed that the Commission can adopt that methodology to determine support levels for non-rural LECs beginning in 1999. As we stated in the Order, we will select a model platform design by January 1, 1998, and a complete mechanism, including all input values, by August 1998.[20] The selected mechanism will not be used to calculate support for rural LECs. We will issue a further notice of proposed rulemaking on a forward-looking economic cost mechanism for rural carriers by October 1998.[21]

II. GENERAL BACKGROUND

8. In March 1996, as required by section 254 of the Communications Act of 1934 (the Act), the Commission established a Federal-State Joint Board on Universal Service (Joint Board) and issued a Notice of Proposed Rulemaking.[22] On November 7, 1996, the Joint Board adopted a Recommended Decision concluding that universal service support in rural, insular, and high cost areas should be set by considering the cost of providing universal service, as determined by a forward-looking cost methodology, less a benchmark amount.[23] On May 8, 1997, having sought, received, and reviewed comments on the Joint Board's recommendations, the Commission released its initial Report and Order on Universal Service.[24]

9. In the Order, we reached the decisions relating to calculation of support for serving rural, insular, and high cost areas that defined and gave structure to the new universal service support mechanism. Specifically, we concluded that support should be provided based on forward-looking economic costs,[25] that non-rural LECs should begin to receive support based

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[20] Order at para. 245.

[21] Order at para. 252.

[22] Federal-State Joint Board on Universal Service, *Notice of Proposed Rulemaking and Order Establishing a Joint Board*, CC Docket No. 96-45, FCC 96-93 (rel. Mar. 8, 1996). *See also* Public Notice, Commission Staff Releases Analysis of Forward-looking Economic Cost Proxy Models, DA 97-56 (rel. Jan. 9, 1997); Public Notice, *Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, DA-96-1078 (rel. July 3, 1996).

[23] Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Recommended Decision*, 12 FCC Rcd 87 (1996) (Recommended Decision). For a definition of the specific services covered by the term "universal service," *see* Order at Section IV, paras. 56-107.

[24] *See supra* note 2.

[25] Order at para. 224.

on a forward-looking mechanism on January 1, 1999,[26] that rural LECs should make the transition later,[27] and that the federal universal service mechanism should provide 25 percent of the support amount, based on the traditional separation of loop costs between the state and federal jurisdictions.[28] At the same time, we recognized a need for more information before we could fill in the details essential to the successful operation of the new support mechanism. We therefore concluded that we needed more information before we could adopt a specific forward-looking economic cost methodology. In particular, we found that none of the three forward-looking models that had been submitted to the Commission was sufficiently reliable in its current form to be used to determine universal service support.[29] In the Order, we acknowledged the need for further development of a forward-looking economic cost mechanism and announced our intention to issue a Further Notice of Proposed Rulemaking to allow notice and comment on specific questions related to the cost models.[30]

10. Consistent with the Joint Board's recommendation, we concluded in the Order that universal service support in high cost areas should be determined by subtracting a benchmark amount from the forward-looking cost of service calculated using a forward-looking cost methodology. We also found that some amount of local usage should be included in the definition of universal service, but concluded that further comment was required before the level of usage could be set. Through this Notice, we seek the information needed to resolve these issues and thus further develop the definition of the mechanism through which non-rural carriers will be compensated for providing universal service in rural, insular, and high cost areas.

III. MODELING FORWARD-LOOKING ECONOMIC COST

A. Background

11. Following the Joint Board's recommendation that the Commission use a forward-looking cost methodology for calculating universal service support, on December 12, 1996 we requested that interested parties present such models and related comments for our

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[26] Order at para. 245.

[27] Order at para. 252-56.

[28] Order at para. 270.

[29] Order at para. 241. *See also* State Members' Report on the Use of Cost Proxy Models, Mar. 26, 1997 (State High Cost Report). In response to the January 9 Public Notice, three different forward-looking cost methodologies were submitted for the Commission's consideration: the Benchmark Cost Proxy Model (BCPM); the Hatfield methodology; and the Telecom Economic Cost Model (TECM). *See* Order at Appendix J for a description of each of the models, as submitted to the Commission.

[30] Order at para. 205.

consideration.[31] In response, parties submitted three models: (1) BCPM;[32] (2) the Hatfield Model (Hatfield 3.1 or Hatfield), developed by Hatfield Associates;[33] and (3) TECM developed by Ben Johnson Associates, Inc.[34] The proposed models use different engineering assumptions and input values to determine the cost of providing universal service. We concluded that the TECM should be excluded from further consideration because the proponents have never provided nationwide estimates of universal service support using that model.[35]

12. The Order concluded that universal service embraced the following services: voice grade access to the public switched network, with the ability to place and receive calls; Dual Tone Multifrequency (DTMF) signaling or its functional equivalent; single-party service; access to emergency services, including in some instances, access to 911 and enhanced 911 (E911) services; access to operator services; access to interexchange services; access to directory services; and toll limitation services for qualifying low-income consumers.[36] In the Order, we concluded, consistent with the Joint Board's recommendation,[37] that support for these services should be based on the forward-looking economic cost of constructing and operating the network facilities and functions used to provide the designated services.[38]

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[31] *See* Public Notice, Federal-State Joint Board on Universal Service: Agenda and Panelists Announced for Staff Workshops on Proxy Cost Models on January 14-15, 1997, CC Docket 96-45, DA 97-60 (rel. Jan. 9, 1997) (Jan. 9 Public Notice).

[32] BCPM was submitted by U S West, Sprint, and Pacific Bell. Letter from Alan Ciamporcero, Pacific Bell, Warren Hannah, Sprint, and Glenn Brown, U S West, to Office of the Secretary, FCC, dated Jan. 31, 1997 (BCPM Jan. 31 submission).

[33] The Hatfield model was submitted by AT&T and MCI. There have been several different versions of the Hatfield model, however all discussion of the Hatfield model in this FNPRM refer to Version 3.1. *See* Letter from Richard N. Clarke, AT&T, to William F. Caton, FCC, dated Feb. 28, 1997 (Hatfield Feb. 28 submission), att. at 5-7. Version 4.0 was submitted to the Commission on July 14, 1997, immediately prior to the release of this FNPRM. Letter from Mike Lieberman, AT&T, to William F. Caton, FCC, dated Jul. 14, 1997 (AT&T Jul. 14, 1997 *ex parte*).

[34] The TECM was submitted by the New Jersey Ratepayer Advocate. Letter from Jonathan Askin, Division of the Ratepayer Advocate, State of New Jersey, to Office of the Secretary, FCC, dated Jan. 6, 1997 (TECM Jan. 6 submission).

[35] Order at para. 241; Minority State Members' Second High Cost Report at 2.

[36] Order at para. 56.

[37] Recommended Decision, 12 FCC Rcd at 184-85.

[38] Order at paras. 224-26. In using the term "forward-looking economic cost," we mean the cost of producing services using the least cost, most efficient, and reasonable technology currently available for purchase with all inputs valued at current prices. In general, we found that support based on forward-looking economic cost sends accurate signals for encouraging the efficient level of entry, investment, and innovation in a local exchange

13. We also concluded that a state could elect to submit its own cost study to calculate the level of universal service support available to carriers in its state, if the state's study meets the criteria outlined in the Order.[39] That study must be based on forward-looking economic cost principles, supported by publicly available data and computations, and be the same cost study that is used by the state to determine intrastate universal service support levels

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market and is sufficient to preserve and advance universal service. Order at paras. 224-26.

[39] Order at para. 250. To ensure consistency in calculations of federal universal service support, any cost study or methodology must meet the following criteria:

(1) The technology assumed in the cost study or model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed. A model must include the incumbent LECs' (ILEC) wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers. The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.

(2) Any network function or element, such as loop, switching, transport, or signaling, necessary to produce supported services must have an associated cost.

(3) Only long-run forward-looking economic cost may be included. The long-run period used must be a period long enough that all costs may be treated as variable and avoidable. The costs must not be the embedded cost of the facilities, functions, or elements. The study or model, however, must be based upon an examination of the current cost of purchasing facilities and equipment, such as switches and digital loop carriers (rather than list prices).

(4) The rate of return should be either the authorized federal rate of return on interstate services, currently 11.25 percent, or the state's prescribed rate of return for intrastate services.

(5) Economic lives and future net salvage percentages used in calculating depreciation expense should be within the FCC-authorized range and use currently authorized depreciation lives.

(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.

(7) A reasonable allocation of joint and common costs should be assigned to the cost of supported services in order to ensure that the forward-looking economic cost does not include an unreasonable share of the joint and common costs for non-supported services.

(8) The cost study or model and all underlying data, formulae, computations, and software associated with the model should be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.

(9) The cost study or model should include the capability to examine and modify the critical assumptions and engineering principles. These assumptions and principles include, but are not limited to, the cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.

(10) The cost study or model must deaverage support calculations to the wire center serving area level at least, and, if feasible, to even smaller areas such as a Census Block Group, Census Block, or grid cell in order to target efficiently universal service support. Carriers must provide verification of customer location when they request support funds from the administrator.

pursuant to 254(f).[40] We did not require that a state perform a new cost study as long as a previous study meets the criteria outlined in the Order.[41] If a state chooses not to submit a cost study, the Commission will determine support levels for carriers in that state using the forward-looking mechanism that we will select in this proceeding.[42] The Commission intended that the criteria also guide the efforts of parties developing forward-looking economic cost models.

14. In the Order, we asked states to elect, by August 15, 1997, whether they will conduct their own forward-looking economic cost studies.[43] States that elect to conduct such studies must file them with the Commission on or before February 6, 1998.[44] We will then seek comment on those studies and determine whether they meet the criteria we set forth in the Order.[45] The Commission will review the studies and comments submitted and approve for use in calculating support levels the state studies that meet the established criteria.[46]

15. The complexity of the forward-looking economic cost models before us, combined with the conflicting design components and lack of supporting data for many of the input values, precluded the Commission from choosing a methodology on May 8, 1997.[47] Because they did not file the underlying justification for the use of their models' input values, the proponents have not shown whether the costs estimated by using their models are the minimum necessary to provide service.[48] Our efforts to study the models, as well as the efforts of commenters, have also been severely hampered by the delay in their submission to the Commission and the constant revisions to the models required to correct technical problems,

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[40] Order at paras. 250-51. In the Order, we also encouraged states filing cost studies to develop permanent unbundled network element (UNE) prices as a basis for its universal service cost studies. State coordination of the methodologies for pricing UNEs and for determining universal service support levels would reduce duplication and diminish arbitrage opportunities that might arise from inconsistencies between the mechanisms for setting unbundled network element prices and for determining universal service support levels. Order at para. 251.

[41] Order at para. 251.

[42] Order at paras. 248-49.

[43] Order at para. 248.

[44] Order at para. 248.

[45] Order at para. 248.

[46] Order at para. 248.

[47] Order at paras. 241-25.

[48] Order at para. 242. This violates the Commission's criterion requiring that all underlying data associated with the model should be verifiable and available to all interested parties for review and comment. Order at para 250, criterion 8.

such as missing data.[49] We determined that further review of the BCPM and Hatfield models will allow the Commission and interested parties to compare and contrast more fully the structure and the input values used in these models and such comparison was essential to selecting the best platform on which the Commission could build a forward-looking economic cost model.[50]

B. General Issues

1. Overview of the Models

16. The BCPM and Hatfield 3.1 models produce dramatically different results, even when modeling a network over the same geographic area, because of differences in both their platform design and their input values. Both models are composed of modules representing the different components of an exchange network. Each module consists of related platform design assumptions and input values.

17. Platform. The "platform" is the set of algorithms that determine the cost of an exchange network and includes a component for each portion of the network. The platform includes all parts of the model that are not user-supplied variables.[51] It includes fixed assumptions that are incorporated into the model, and cannot be altered by the user. For BCPM and Hatfield 3.1, these fixed assumptions include, for example, assumptions regarding the distribution of customers within a particular geographic area, establishment of switch capacity limitations, impact of structure sharing on cost, maximum copper loop length, and method of calculating maintenance and corporate overhead expenses.

18. Inputs. Input values, in contrast, can be altered by the user and include, for example, the prices of various network components, their associated installation and placement costs, as well as various capital cost parameters, such as debt-equity ratios or depreciation rates. Although the models have some similarities in their platform design, their default input values vary greatly.

19. Implementation Schedule. We concluded in the Order that we would select a platform by the end of 1997, and that we would select a complete mechanism, including inputs,

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[49] Order at para. 243; State High Cost Report at 1, 7; Majority State Members' Second High Cost Report at 5.

[50] Order at para. 245.

[51] In the Order, however, we used the term "platform" generally in ways that might imply a reference to an entire model, which would include both the design components and inputs values. *See, e.g.*, Order at para. 245. Throughout this FNPRM, we employ a more precise definition of "platform" to refer only to the fixed algorithms and assumptions of a model.

by August 1998.[52] The Commission's methodology will be implemented on January 1, 1999.[53]

20. BCPM. Proponents of BCPM describe it as a geographically based, high-level engineering model of the local telephone network that can be used to estimate costs for providing residential and business basic telephone service in small geographic areas.[54] The model defines a network capable of providing basic single-party voice grade telephone service that allows customers to use currently available modems to gain access to information services by calling an information service provider. BCPM has three modules: (1) the investment module, used to calculate network investments;[55] (2) the capital cost module, used to calculate capital cost factors and expenses; and (3) the reports module, which produces reports of the model's results on either census block group (CBG), CLLI,[56] state, company, holding company, or nationwide basis.[57]

21. Hatfield 3.1. Proponents of the Hatfield 3.1 model describe it as an engineering model of a local exchange telephone network with sufficient capacity to meet total demand for telephone service and to maintain a high level of service quality,[58] and capable of estimating the forward-looking economic costs of: (1) unbundled network elements (UNEs), based on total element long-run incremental cost (TELRIC) principles; (2) basic telephone service, as defined by the Commission; and (3) carrier access to, and interconnection with, the local exchange network.[59] Its proponents state that the Hatfield model constructs a "bottom up" estimate of costs based on detailed information concerning customer demand, network component prices, operational costs, network operations criteria, and other factors affecting the costs of providing local service.[60]

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[52] Order at para. 245.

[53] Order at para. 245.

[54] BCPM Jan. 31 submission, att. 9 at 108.

[55] The investment module develops investment costs for the feeder and distribution plant by modeling a network based on the location of customers, estimated using census block group data, assumptions about customer dispersion, and the location of serving wire centers.

[56] CLLI stands for Common Language Location Identifiers and refers to a system of codes used by Bellcore to identify the location of telephone facilities and equipment.

[57] BCPM Jan. 31 submission, att. 9 at 112-13.

[58] Hatfield Feb. 28 submission at 3-4.

[59] Hatfield Feb. 28 submission at 4.

[60] Hatfield Feb. 28 submission at 3-4.

22. Hatfield's platform contains four modules: (1) the distribution module, which calculates distribution distances and investment;[61] (2) the feeder module, which calculates loop feeder distances and investment;[62] (3) the switching and interoffice module, which calculates switching, signaling, and interoffice investment; and (4) the expense module, which calculates the cost of capital, expenses, UNE unit costs, and access costs.

2. Procedures for Revising the Models

23. In the Order, we noted that our effort to evaluate the models fully was limited by the continuous revision of the models, yielding significantly different outputs, often in different formats. Although we realize that these difficulties are inherent in an effort to improve the models, we find that we should adopt specific procedures and documentation requirements to allow the Commission and the parties to compare and validate the models most effectively.

a. Staged Submission and Review of Individual Model Components

24. Because the platform is chiefly a summation of the individual algorithms and assumptions determining the cost of each component of an exchange network, our adoption of a model platform will be based on an evaluation of the performance of each component. We thus expect that all future submissions of the platforms of the two models will be flexible enough to incorporate revisions within the individual component algorithms. We recognize, however, that design decisions regarding a particular component may control the output of another component. For example, the algorithm that determines the distribution of customers will affect the platform's output regarding the drop length.[63] We thus believe that the Commission staff's consideration of the design features of individual components on a staged basis prior to the December 1997 date for selection of a comprehensive platform will provide model proponents necessary guidance regarding such interdependent components. During the course of this process, we will consult regularly with the proponents and state regulators to address any concerns and to understand clearly their perspectives. Furthermore, because the design features for the components vary in complexity, we conclude that a graduated submission and review process will permit us, the states, and the public, to evaluate all features thoroughly. We conclude that, besides affording the Commission sufficient time to evaluate the more complex platform components, requiring proponents to present individual components for final

[61] The models consider "distribution" to be the portion of the loop between a customer's premises and a service area interface (SAI) or a digital loop carrier (DLC).

[62] The models consider "feeder" to be the portion of the loop between the central office and a SAI or DLC. The cost of a SAI or DLC are included within the feeder module.

[63] A drop is the connection between a residence or business and the distribution cable. The estimated distance between the customer location and distribution cable is dependent on the algorithm that determines customer distribution within a geographic unit. *See infra* section III.2.C.

submission in stages will prevent constant revisions of an entire platform from disrupting our evaluation process. This approach is intended to focus the model proponents, other parties, and the Commission's attention on particular aspects of the models at a given time. This approach will also allow the states to follow more easily our process of improving the models to facilitate their development of cost studies to be submitted in this proceeding and their implementation of their own universal service programs.

25. Staged Platform Submission Schedule. We require that comments concerning the platform design of the switching, interoffice trunking, signaling, and local tandem components must be submitted on or before August 8, 1997, and parties should submit corresponding reply comments on or before August 18, 1997. Comments concerning the platform design features determining customer location, including the geographic unit for cost calculations and the algorithm measuring customer distribution and line counts, be submitted to the Commission on or before September 2, 1997 and reply comments regarding these components be submitted on or before September 10, 1997. Comments discussing the outside plant investment components, including the algorithms determining plant mix, installation and cable costs, drop lengths, structure sharing, the fiber-copper cross-over point, digital loop carriers, and the wireless threshold must be submitted on or before September 24, 1997, with reply comments submitted on or before October 3, 1997. Comments discussing all platform issues not otherwise addressed, including the components addressing general support facilities, expenses, and support areas must be submitted by October 17, 1997, with reply comments due on or before October 27, 1997. Appendix A contains a chart summarizing the submission schedule for comments and reply comments.

26. Commission Guidance. Before and during the initial comment and reply comment periods, we intend to hold one or more public workshops on particular model platform components. Further, prior to our adoption of a particular platform in December 1997, the Common Carrier Bureau will issue orders and public notices on a regular basis explaining its analysis of the model submissions and industry comments and to select particular design features. We will work with the states throughout this process so that the selected mechanism reflects the concerns of state regulatory authorities in developing forward-looking economic cost methodologies for state universal service programs or for cost studies to be submitted in this proceeding. Thus, our guidelines to the proponents will reflect state participation in the modeling process. We anticipate that such guidance from the Bureau will provide the proponents with necessary direction to refine their models and encourage a convergence of the two platforms to a design that combines the best features of both models. We will also meet with the model proponents on a regular basis to ensure that they are able to implement our directives. Following our last order on the components of a platform, we will ask the proponents to resubmit a platform that incorporates each of our guidelines.

27. Inputs Submission. As noted earlier, we must also reach agreement on the input values for each of the components. Although we have stated our intention to select default input

values by August 1998,[64] we must receive the proponents' input submissions in order to evaluate a model's performance. We therefore require that comments regarding all input values be submitted by October 17, 1997. Reply comments must be submitted by October 27, 1997.[65]

28. Supporting Documentation. Commenters should provide explanation and documentation of their suggestions in order to establish that their suggestions are reasonable, accurate, and reflect forward-looking cost.

b. Output Reports

29. Hatfield 3.1 and BCPM generate output reports that contain different information, and in some cases the information is in summary form only. These differences and summaries hamper our ability to compare the effect of changes in inputs values and platform design assumptions. Our ability to review the models would be improved if the models produced similar output reports and generated certain additional detailed reports. We therefore request that the models be modified, if necessary, to generate output reports that: (a) show costs by element of the network; (b) disaggregate study area expenses, investments, taxes, and return according to USOA accounts; and (c) calculate study area support as the difference between CBG cost and the benchmark for every CBG in a study area.

c. Flow Charts

30. Both models combine Excel spreadsheets and Visual Basic programs in a manner that makes it extremely difficult to trace cost calculations without a flow chart that clearly indicates how calculations are being made. Therefore, we request that parties providing the models under consideration provide us with a clear and comprehensive programmers' flow chart.[66] This flow chart should include a main logic section that schematically shows the relationships between all structural components of the model, all decision nodes, all inputs, and all outputs. The structural components should be identified by the names by which they are recognized by the software that processes them. Source code for any components written in Visual Basic or other programming language must also be provided.

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[64] Order at para. 245.

[65] *See infra* app. A, Comment Submission Schedule.

[66] The flow chart should conform to ANSI/ISO 5807-1985, Information Processing - Documentation Symbols and Conventions for Data Program, and Systems Flowcharts, Program Network Charts, and Systems Resources Charts (revision and redesignation of ANSI X3.5- 1970).

d. Company Identification

31. The models submitted purport to estimate costs and support requirements for every ILEC in the nation. In some instances, however, it appears that companies listed by one of the models do not appear in the database of the other model.[67] We note that the National Exchange Carrier Association (NECA) maintains a list of telephone companies with unique study area names and study area identification codes. We therefore request that the models be revised, if necessary, to employ the NECA telephone company study area names and identification codes in all subsequent revisions.

e. Revisions

32. Each model has already been revised several times, and we expect each of them will be revised further. To enable the Commission and commenters to manage their resources most effectively, we request that the parties submitting models give us and commenters reasonable advance warning of the approximate date when they expect to release a new version of a model. In addition, if a party intends to release a new version of a model that is designed to work with a software or hardware product that differs from the previous version, we request that party give us and others reasonable advance notice of what hardware and software they must secure to operate and evaluate the new version of the model. The Commission will maintain a page on our Web site in order to facilitate the ability of the model proponents to make this information available. Upon specific request of the model proponents, the Universal Service Branch of the Accounting and Audits Division of the Common Carrier Bureau, will place information about upcoming changes to the models on our Web site.[68] Finally, we request that a party that releases a new version of a model clearly indicate to us and others the major changes have been made, and, in particular, any additions to the model.

f. Documentation

33. The models rely on at least two entities to supply and transform data. Hatfield 3.1 relies on an algorithm developed by PNR Associates to assign second residential lines and business lines across CBGs. BCPM relies on an Ontarget exchange information database to assign CBGs to wire centers. Neither the PNR algorithm nor the Ontarget database have been made available to the Commission. Without detailed information regarding these basic inputs into the models, we cannot adequately evaluate the models. In addition, the model proponents rely on information that they have gathered from other sources and they have not yet filed this information with the Commission. For example, the Hatfield proponents have not filed several

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[67] *See* Letter from Mary Liz Hepburn, NYNEX, to William F. Caton, FCC, dated May 29, 1997 (NYNEX May 29 *ex parte*).

[68] The address of this web site will be: "http://www.fcc.gov/ccb/universal_service/cost_models/".

studies that Hatfield 3.1 uses to adjust its expense ratios, and the BCPM proponents have not filed the survey that BCPM uses to determine per-line expenses. We request that the model proponents file complete documentation including all third-party information, studies, and surveys used by the models. We understand that some of this information is proprietary and cannot be released to the public, and we encourage parties to use the Commission's procedures for submitting proprietary information to the Commission.[69]

3. Hybrid Models

34. For the mechanism that we will adopt in this proceeding, we must determine the design components of the platform and input values that will most accurately estimate carriers' forward-looking economic costs. Although they share some design features, BCPM and Hatfield 3.1 differ in many respects and possess different strengths and weaknesses. We strongly encourage the proponents of Hatfield 3.1 and BCPM to refine their models by incorporating portions of the other's model that we suggest below to be superior to the approach taken in their own model. We believe that our staged review of individual components of the platform will encourage the proponents to work with other members of the industry, states, and the Commission, to develop a model that contains the best features of both models.

35. We note that the model proponents have not yet fully resolved a number of difficult technical issues. For example, we believe that the distribution of population within a CBG has not been accurately estimated by either model.[70] We identify other advantages and disadvantages of the current models in the remainder of this FNPRM. The majority state members of the Joint Board suggested that the Commission make final modifications on the platform chosen.[71] We agree that the selected mechanism must be under the Commission's control, but believe that our cooperative efforts with the industry and with the states have yielded many advances. As outlined in section III.B.2., we believe that active Commission involvement in a staged evaluation process will contribute to the selection of a final model platform that meets our guidelines. As part of this review process we intend to study alternative algorithms and approaches that could be submitted by parties other than model sponsors or that could be generated internally by Commission staff. One possible outcome of this approach would be the development of a hybrid model that combines selected components of both models with additional components and algorithms drawn from other sources. We seek comment on this approach.

36. Whether the Commission chooses to create its own model or whether it relies

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[69] *See* 47 C.F.R. § 0.459.

[70] *See infra* paras. 37-43.

[71] Majority State Members' Second High Cost Report at 1.

upon a model developed by the industry, we seek comment on the ramifications of combining features of the two models. Specifically, we seek comment on whether combining algorithms from Hatfield 3.1 and BCPM would result in an accurate predictor of forward-looking economic costs, or whether alterations in the models would be necessary to combine the models. For example, we tentatively conclude below that the Hatfield model provides a better algorithm for determining population distribution by taking into account population clusters. Similarly, we tentatively conclude below that the BCPM model provides a superior method to account for additional installation expenses by prescribing additional costs. We ask commenters to identify what portions of the two models could be combined, and what portions are not compatible with one another. Commenters should discuss in detail the steps that must be taken, if any, to combine the models.

37. Finally, we seek comment on whether alternative platform components or assumptions, not currently included in either Hatfield 3.1 or BCPM, could be incorporated into Hatfield 3.1, BCPM, or a hybrid model created by the Commission. We encourage not only the proponents of the models under consideration, but also commenters who are not associated with either of the models, to submit algorithms that could be successfully incorporated into the models and that would address the specific concerns we raise below.

38. As discussed in section III.B.2, interested parties may file comments on these issues on or before October 17, 1997, and reply comments on or before October 27, 1997.[72]

C. Platform Design Components and Input Values

1. Customer Location

a. Geographic Unit

(1) Background

39. Platform Design. The size of the serving areas over which cost is calculated is an important element of platform design. Small geographic units lead to more accurate cost estimates and avoid wide disparities in the cost of serving different customers in the same service area.[73] Such disparities could make it profitable for new entrants to serve only the lowest cost customers in the service area, and to leave the remaining, less-profitable customers to the carrier of last resort. On the other hand, some commenters argue that, because many input data, such as line counts, are not available for such small areas, using excessively small geographic units makes the model more complex, requires more powerful computers to calculate universal

[72] *See infra* app. A, Comment Submission Schedule.

[73] *See, e.g.*, GTE model comments at 43.

service support, and creates a false sense of precision because the input data is still not disaggregated at that level.[74] In the Order, we determined that any cost study or model submitted must calculate support at least at the wire center serving area level, and, if feasible, for even smaller areas such as a CBGs, CBs, or grid cells to permit us to target universal service support more efficiently.[75] Both BCPM and Hatfield base all cost calculations on CBGs.

(2) Issues for Comment

40. Platform Design. In the Order, we concluded that the selected mechanism for determining the cost of supported services should use a geographic unit no larger than a wire center, or a smaller areas such as a CBG, CB, or grid cell if feasible.[76] We seek comment, however, on whether we should adopt, as the geographic unit for cost calculation, an area smaller than a CBG. We seek comment on whether using CBGs, CBs, or grid cell data would allow us to calculate the cost of providing universal service more accurately and would better target support. Advocates of using geographic units smaller than CBGs should also discuss the technical feasibility of their proposal and the availability of relevant data at the proposed level of detail.

b. Distribution of Customers

(1) Background

41. Platform Design. Customers may be clustered in towns, spread uniformly over regions, or otherwise distributed across CBGs. The models use algorithms to project the customer distribution within a geographic unit in order to estimate the cost of the outside cables required to serve customers. In general, BCPM uses a uniform customer distribution algorithm, which assumes that customers are spread evenly across an entire CBG. In rural areas, BCPM eliminates areas from the CBG data that are more than 500 feet from any road, based on its assumption that households are located within 500 feet of a road.[77] Several commenters criticized the assumption, present in BCPM, that households are evenly distributed across a

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[74] AT&T/MCI model comments at 12-13.

[75] Order at para. 250, criterion 10. The Bureau of the Census defines a "census block group" as "generally contain[ing] between 250 and 550 housing units, with the ideal size being 400 housing units." U.S. Census Bureau, 1990 Census of Population and Housing, at app. A, "Area Classifications" (issued Mar. 1992). Hatfield examines data from the individual census blocks (CBs) included in any CBG to eliminate areas that have no population from its analysis of CBG cost.

[76] Order at para. 250, criterion 10.

[77] Letter from Warren D. Hannah, Sprint , to William F. Caton, FCC, dated Jul. 15, 1996, attachment (Sprint Jul. 3 *ex parte*).

geographic unit.[78] In addition, the Rural Utilities Service (RUS) asserted that BCPM's assumption that all households are within 500 feet on a road is not true in many rural areas.[79] At the proxy model workshops, a panelist provided several examples of specific locations where the uniform distribution assumption would cause significant errors.[80] In addition, the panelist concluded that similar distortions exist in large regions of the country, and therefore, the uniform distribution assumption causes the model to overstate costs for many states.[81]

42. In contrast to BCPM, Hatfield uses a clustering algorithm.[82] The Hatfield algorithm first removes the empty space within each CBG by removing CBs when census data indicates that they do not contain any population.[83] In low-population-density CBGs, the Hatfield algorithm clusters 85 percent of the population within a town.[84] For dense areas, Hatfield uses a clustering algorithm that establishes two clusters if more than fifty percent of the CBG is empty and four clusters where 50 percent or less of the CBG is empty.[85] Finally, in CBGs where the line density is so high that customer locations must necessarily be "stacked," the Hatfield algorithm assumes that the population lives in multi-unit dwellings.[86]

43. A NYNEX representative at the workshop expressed concerns about both models' assumptions about the relationship between the location of the central office and census blocks.[87] He argued that, when the models do not predict an accurate relationship between population and the central office, the models could incorrectly predict high costs for areas that actually have low costs, sending false signals to competitors and causing unnecessary support flows.[88] State Joint

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[78] *See* Aliant model comments at 3; Rural Telephone Coalition (RTC) model comments at 10; BANX model comments at 12-13 (stating that, while this assumption may be reasonable for some parts of the country, it is not descriptive of areas in the Northeast and Mid-Atlantic).

[79] RUS model reply comments at 3.

[80] Proxy Model Workshop, Jan. 15, panel four.

[81] Proxy Model Workshop, Jan. 15, panel four.

[82] Hatfield Feb. 28 submission at 28-31.

[83] Hatfield Feb. 28 submission at 29-30.

[84] Hatfield Feb. 28 submission at 30.

[85] Hatfield Feb. 28 submission at 29-30.

[86] Hatfield Feb. 28 submission at 30.

[87] Comments from Vincent Callahan, Proxy Model Workshop, Jan. 15, panel four.

[88] Comments from Vincent Callahan, Proxy Model Workshop, Jan. 15, panel four.

Board members note that the assignment of CBGs to serving wire centers is inaccurate for both models and that both models have inherent errors based on their assumptions regarding the location of wire centers relative to the geographical centers (or "centroids") of CBGs.[89]

(2) Issues for Comment

44. Platform Design. It appears, as the workshop panelists suggested, that, because population clustering actually occurs, the assumption that the population of a CBG is uniformly distributed across the CBG may distort the models' results. Assumptions about the location of the population can have a large impact on the support amounts that the models predict because these assumptions determine the predicted loop length. This is because a large percentage of the cost of service is the cost of the loop. In addition, the cost of the loop increases with the length of the loop. We thus tentatively conclude that a clustering algorithm would more accurately distribute customers within some CBGs and would consequently generate more accurate estimates of loop length and, therefore, of the cost of the outside plant. Furthermore, we tentatively conclude that, if a model presumes that customers are clustered, the accuracy of the position of the population cluster relative to the wire center is important to an accurate prediction of the necessary support amount. We therefore tentatively conclude that the selected mechanism should calculate population clusters' proximity to wire centers with more precision that the models currently permit. We seek comment on our tentative conclusions and also seek comment on how BCPM's uniform distribution algorithm and Hatfield's clustering algorithm could be modified to provide more accurate information regarding the locations of customers.[90] We also seek comment on how to improve both models' accuracy in assigning CBGs to serving wire centers. As described in more detail below, we also seek comment on the availability, feasibility, and reliability of software that will geo-code households, that is, assign households a latitude and longitude.[91]

45. We seek comment on whether, instead of the methods currently used by either Hatfield 3.1 or BCPM, an alternate method should be used to locate population in carrier serving areas. Generally, we seek comment on whether loop lengths should be more closely linked with actual loop statistics. We seek comment on whether a method that combines actual geographical maps, census data, and the location of the serving wire centers would estimate customer location, and therefore costs, better than the algorithms currently used by the models.

46. We specifically seek comment on whether the following proposal would be a

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[89] State Members' High Cost Report at 7-8.

[90] Letter from Joel Shifman, Maine Public Utility Commission (PUC), to William Caton, FCC, dated Feb. 14, 1997 (Maine PUC Feb. 14 *ex parte*).

[91] *See infra* section III.D.

more accurate method by which to estimate the distribution of customers. In relation to locating residential population, we note that census data provide the number of households within a CB as well as internal point coordinates and polygon vertex coordinates.[92] We seek comment on what currently available commercial mapping software, if any, could be used to identify the location of customers in all CBs within a service territory. We further seek comment on whether a model should impose a uniform grid over an ILEC's service territory in order to create subscriber population clusters, determining the size of the cluster according to the technology constraints of electronic systems that are used to provide universal service, such as Asymmetric Digital Subscriber Line (ADSL)[93] and High bit rate Digital Subscriber Line (HDSL)[94] technologies, rather than basing cluster sizes on census data. For example, the use of ADSL technology results in a maximum loop length of 18,000 feet. We note that the cluster could then be filled by CB data that provides the number of households within the block, as well as location information. We seek comment on how this proposal compares with the methods employed by BCPM and Hatfield. Specifically, we seek comment on whether this approach is more representative of the engineering design of a network because it does not rely on census-mapping conventions.

47. We seek comment on whether the above proposal could be incorporated into either Hatfield 3.1, BCPM, or any hybrid model that the Commission may develop. We also seek comment on whether any alterations in either BCPM or Hatfield would be necessary to incorporate this proposal into either model or a potential hybrid model.

c. Line Count

(1) Background

48. The selected mechanism must estimate a line count at the wire center, CBG, or CB level if we conclude that cost estimates should be developed at those levels.[95] Relatively

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[92] An "internal point" is defined by the Census Bureau to be the centroid (i.e. the center) of a census block unless the centroid is outside the boundaries of the block or located in a body of water. U.S. Census Bureau, 1990 Census of Population and Housing, at app. A, "Area Classifications" (issued Mar. 1992); *see also* http://www.census.gov/td/stf3/append_a.html#INTERNALPOINT. A vertex point is a point at which two sides of a polygon meet. For example, a triangle has three vertex points. In this instance, a vertex point is the point at which two segments of the boundary defining the census block meet.

[93] ADSL technology consists of a one-way T-1 to the home in addition to the plain old, single twisted pair wiring already connected to homes.

[94] HDSL technology puts a two-way T-1 on a normal unshielded, bridged (but not loaded) twisted pair of without using repeaters.

[95] In addition, consistent with our Order, the models must develop a method for matching a model's wire center line count to a LEC's wire center line count. Order at para. 250, criterion 1.

reliable estimates of line counts are currently available at the study area and state level, but not at the wire center, CBG or CB level. For example, the number of subscriber lines for every ILEC is included among the universal service data published in our monitoring report.[96] The Automated Reporting and Management Information System (ARMIS) database also contains information on the number of residential, business, and special access lines.[97] This public information, however, does not disaggregate the line counts at the wire center or CBG level. Thus, each model must assign lines to CBGs and wire centers.

49. The state members of the Joint Board have voiced concern about the estimates of customer lines per wire center generated by each model.[98] The state members assert that errors in these estimates might be traced to assignment of CBGs to incorrect wire centers.[99] The Majority State Members Report calls for a requirement that models should match within ten percent actual wire center line counts.[100]

50. Platform Design. BCPM uses 1995 Census estimates of the number of households in each CBG. BCPM estimates the total number of residential lines for each CBG by allocating actual residential access lines in a state based on the number of households in a CBG. BCPM estimates the number of business lines by allocating actual business access lines in a state to each CBG based on the number of employees in the CBG per Dunn & Bradstreet data.[101] Once lines have been allocated to the CBGs, BCPM assigns CBGs to wire centers by assigning the CBG to the wire center closest to the centroid of that CBG.[102]

51. Starting from a 1995 Census household estimate, Hatfield 3.1 estimates the residential line counts for each CBG.[103] It removes households without telephones (according to

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[96] *See, e.g.*, Monitoring Report, CC Docket No. 87-339 (May 1996) tbl. 4.19.

[97] ARMIS is an automated system developed in 1987 for collecting financial and operating information from certain carriers. Additional ARMIS reports were added in 1991 for the collection of service quality and network infrastructure information from local exchange carriers subject to our price cap regulations. Today, ARMIS consists of ten reports. *See* Reform of Filing Requirements and Carrier Classifications, *Report and Order*, CC Docket No. 96-193, FCC 97-145 (rel. May 20, 1997) at para. 6.

[98] State Members' High Cost Report, app. A at 8.

[99] State Members' High Cost Report, app. A at 8.

[100] Majority State Members' Second High Cost Report at 11.

[101] BCPM Jan. 31 submission, att. 9 at 109.

[102] Hatfield Feb. 28 submission at 8.

[103] Hatfield Feb. 28 submission at 21-27.

1990 Census information) and adds second lines for some households using an estimated relationship between second lines and CBG data about the income and age of consumers. Hatfield 3.1 assigns business lines to CBGs on the basis of the number of employees within a CBG, as BCPM does, but also considers the relative intensity of telephone demand across different industries. The detailed analysis that underlies these assignments, however, was not filed with the Commission.[104] The sum of all residential and business lines assigned to CBGs by Hatfield 3.1 matches state totals for residential and business lines. Finally, each CBG is assigned to the ILEC wire center that serves more customers in that CBG than any other.[105] According to the Majority State Members Report, Hatfield attempts to include special access lines, but BCPM does not.[106]

52. Both models use a closing factor, i.e., a ratio of line counts, as provided by the NECA and ARMIS databases, compared to the models' estimates, to adjust the estimates produced by their algorithms to reflect the actual ILEC line counts. Neither model, however, clearly discloses the closing factors for all lines that are used in their line count calculations.

(2) Issues for Comment

53. Platform Design. At this time it appears that neither the Hatfield nor BCPM algorithms accurately predict line count, and seek comment on what changes can be made to those algorithms to improve their accuracy. Because reliable line counts are necessary for determining accurate cost estimates, it appears that reasonable estimates of the number of lines in each CBG, CB, or grid cell are necessary to calculate universal service support, even if we decide to provide support on a wire center basis. Reasonable estimates of lines at the wire center and study area level will allow us to verify that the models' means of estimating line-count leads to accurate results. The models' algorithms should produce estimates that are accurate enough to avoid the need for a large closing factor to force the line-count estimate to match the wire center line count. We tentatively conclude that the sizes and uses of models' closing factors should be evident to the user so that they may be evaluated. We seek comment on whether the selected mechanism should adopt a maximum closing factor of 10 percent, as suggested by the state members of the Joint Board. We also seek comment on whether other data sources could be used to enhance the models' algorithms or be used to create an alternative method for determining line counts. We seek comment on whether, for example, we should assign business lines to geographic units by using commercially produced maps that give the coordinates of all

[104] Hatfield Feb. 28 submission at 21-27.

[105] Hatfield Feb. 28 submission at 21-27. The wire center that serves the most lines in the CBG is determined based on the most prevalent assignment of numbering plan area codes and central office codes (NPA-NXX) in the CBG. The NPA-NXX codes (corresponding to the area code and first three digits of a telephone number) identify the wire center that serves a given line.

[106] Majority State Members' Second High Cost Report at 4.

businesses located in the U.S. along with their employment by standard industrial classification (SIC) code. We seek comment on whether such a method should use some multiple of the employment data to estimate the number of business lines in each grid block. Alternatively, we seek comment on whether there are any databases that use zip code information or geo-coding information that could be used to improve the line-count estimation process.

d. Dates for Comments on Customer Location

54. As discussed in section III.B.2, interested parties may file comments on all of the issues regarding customer location on or before September 2, 1997, and reply comments on or before September 10, 1997.[107]

2. Outside Plant Investment

55. Outside plant investment includes every part of an ILEC's network infrastructure connecting the wire center to customer locations.

a. Plant Mix

(1) Background

56. Platform Design. The outside plant consists of a mix of aerial, underground, and buried cable. Aerial cable is strung between poles above ground. Underground cable is placed underground within conduits for added support and protection. Buried cable is placed underground but without any conduit. The plant mix is determined by the geographic distribution of population as well as terrain and weather conditions.[108] For example, terrain that includes hard rock, soft rock, near-surface groundwater, and steep slopes may increase the cost of underground plant placement substantially when compared with terrain that includes normal soil conditions. An efficient carrier will minimize forward-looking costs when selecting a mix of aerial, buried, and underground cable. For example, an efficient provider facing difficult terrain might determine that aerial plant has the lowest forward-looking costs, despite its higher maintenance costs, because aerial plant has substantially lower installation costs, or due to terrain or climatic conditions. Similarly, an efficient provider facing severe weather conditions, such as hurricanes, might determine that underground or buried cable has lower forward-looking costs than aerial cable, despite its higher installation costs. Although both Hatfield and BCPM include terrain factors and line density zones to estimate the cost of installing cable, neither

[107] *See infra* app. A, Comment Submission Schedule.

[108] In this regard, we note that GVNW has shown that actual plant mix varies with soil type. Letter from Bob Schoonmaker, GVNW, to William F. Caton, FCC, dated Feb. 20, 1997 (GVNW Feb. 20 *ex parte*).

model incorporates terrain factors to make decisions about outside structure plant mix. In addition, neither model seeks to minimize the total lifetime cost, including maintenance, of outside structure plant mix.

57. Input Values. Both BCPM and Hatfield use tables to assign the percentage share of feeder and distribution cable to aerial, buried, and underground installation. These percentages vary only by line density zone. The Hatfield model generally assigns more aerial cable, and BCPM assigns more buried cable. In very high-population density areas, both models assign most cable to underground installation. Both BCPM and Hatfield allow the user to alter plant mix assumptions for each population density zone, or to accept the default values supplied with the models.

(2) Issues for Comment

58. Platform Design. It appears that, while both models have made many improvements, the failure of both BCPM and Hatfield to incorporate terrain factors into their plant-mix tables seriously undermines the accuracy of the outside plant costs predicted by each model. For example, their assumptions that carriers will bury cable, regardless of terrain conditions, will lead to predictions of costs well above levels incurred by an efficient provider in very rocky areas or in areas with near-surface ground water. We thus find that an efficient carrier will vary its plant mix according to the population density of an area. We, therefore, tentatively conclude that the assignment of plant mix defined by the selected mechanism should reflect both terrain factors and line density zones. Specifically, we tentatively conclude that relatively more feeder and distribution cable should be assigned to aerial installation for all population density groups in wire centers characterized by "hard rock" conditions than those in wire centers with other terrain conditions. We seek comment on these tentative conclusions. We also seek comment on identifying the terrain that would lead an efficient firm to minimize forward-looking costs by using aerial plant and on whether climate conditions, such as the possibility that a hurricane will destroy aerial plant, will affect an efficient carrier's decision to deploy aerial plant.

59. Input Values. We direct the models' proponents to justify fully the default values they selected for their outside-structure plant mix. We note that recent installations of outside structure may more closely meet forward-looking design criteria than do historical installations. We seek comment on these issues and encourage parties to file documentation supporting suggestions to alter either Hatfield or BCPM's input values or default assumptions concerning plant mix. We also seek comment on the input values that will accurately reflect the level of impact that varying terrain conditions have on costs.

b. Installation and Cable Costs

(1) Background

60. The default values for installation costs included in the BCPM and Hatfield models represent their proponents' estimates of the total cost of installing wire and cable facilities. The forward-looking economic cost mechanism must estimate the cost of installing wire and cable facilities as part of the overall cost of building a network to provide supported services. These costs can be expected to vary by soil type and line density zone. In very rocky terrain or in densely populated areas, for example, the cost of digging through rock or pavement will increase installation costs.

61. Design Platform. Both BCPM and Hatfield make assumptions about soil conditions and population density to estimate the cost of installing buried and underground cable. Specifically, the models use different numbers of density zones. It appears that a greater number of density zones helps identify high and low cost areas more accurately; too many density zones, however, would make the data calculations too complex. BCPM makes different estimates for the cost of installing conduit and buried cable in each of seven line density zones (categories based on the number of households per square mile). BCPM also distinguishes between the costs of installing feeder and distribution cable and includes detailed tables for installation costs in various soil conditions. Moreover, cost estimates used take into account the costs of different installation methods, and the relative frequency of each installation method for each soil type.

62. Hatfield uses separate cost estimates for each of nine different line density zones, and defines these zones based on the number of lines per square mile, rather than households. Hatfield accounts for rocky conditions by multiplying the cost of cable by a factor that is adjusted depending on depth to bedrock, hardness of bedrock, and surface soil texture.[109] It also includes an additional distance multiplier to reflect the assumption that difficult soil conditions will increase the length of feeder and distribution cable by 20 percent. Hatfield also uses a slope factor to account for steep terrain for both conduit and buried installations. Hatfield does not separately identify installation costs for aerial cable, but includes installation costs in the cost of the cable itself.[110]

63. Input Values. BCPM's input values appear as table entries that can be adjusted by the user. The BCPM does not differentiate the cost of installing feeder from the cost of installing distribution by soil type, but it does differentiate the costs for feeder cable from

[109] A multiplier of 1.2 extends cable in difficult soil conditions, hard rock placement multiplies costs by 3.5, soft rock placement multiplies costs by 2.0.

[110] Hatfield Feb. 28 submission, app. B at 9.

distribution cable. Costs for installing feeder and distribution cable range from $1.14 to $13.82 per foot for installations in normal soil and up to $18.92 per foot for installation in hard rock. The BCPM adds 30 percent to installation costs if groundwater is within three feet of the surface. The BCPM also increases cable distance by 10 to 35 percent in the presence of steep grade for both buried cable and conduit. BCPM lists distribution cable costs ranging from $1.16 to $61.78 per foot, aerial cable being the most expensive cable type.

64. Hatfield's cost multipliers can be adjusted by the user. Hatfield's costs for conduit range from $10.29 to $75.00 per foot for normal soil. Hatfield assigns copper and fiber conduit equal installation costs. For fiber cable conduit, Hatfield adds $0.20 per foot for protective sheathing. For fiber feeder cable conduit, Hatfield assumes that pullboxes are installed every 2000 feet. For both conduit and buried cable, Hatfield includes several multipliers to increase costs to account for difficult soil conditions, hard rock placement, and soft rock placement.[111] Hatfield's costs for buried cable range from $1.77 to $45.00 per foot for normal soil, whether fiber or copper. Hatfield lists distribution cable sizes from 6 to 2400 pairs, with costs ranging from $0.63 to $42.75 per foot, including installation, delivery, and the cable itself.

(2) Issues for Comment

65. Platform Design. We tentatively conclude that the selected mechanism should specify costs for installation of aerial cable, buried cable, and underground cable that incorporate terrain factors and line density zones. We seek comment on this tentative conclusion.

66. In the Majority State Members' Second Report, state members expressed preference for BCPM's approach because they found that Hatfield's approach did not adequately account for the effect of different types of installation activity on outside plant costs, and because using a multiplier will overestimate costs in some areas and underestimate costs in other areas.[112] Based on the majority state member's recommendations, we tentatively conclude that the selected mechanism should adopt BCPM's approach of prescribing additional costs to account for additional expenses caused by difficult terrain, rather than Hatfield's approach of using cost multipliers. We seek comment on this tentative conclusion, on how this tentative conclusion would affect cost estimates, and on the appropriate input values for such additional expenses. In addition, we seek comment on the majority state members' conclusion that it is not reasonable to assume, as Hatfield does, that an installer could simply increase its use of distribution cable by 20 percent to avoid burying cable in difficult soil conditions.[113] Commenters disagreeing with our tentative conclusion to adopt BCPM's approach should

[111] *See supra* note 107.

[112] Majority State Members' Second High Cost Report at 8-9.

[113] Majority State Members' Second High Cost Report at 9.

provide data about the costs of installing cable to support platform designs they favor.

67. We tentatively conclude that the selected mechanism should specify costs per foot for conduit installation that vary by line density zone, as proposed in both BCPM and Hatfield. Because it appears that each census-defined household does not necessarily have a single telephone line, we prefer Hatfield's assumption that the number of lines per square mile more accurately measures the line density of a local telephone system than the number of households per square mile, especially in urban areas where there may be few households but many business lines. We therefore tentatively conclude that the mechanism should define density zones based on lines per square mile, as in Hatfield 3.1. We seek comment on these tentative conclusions and on the number of density zones that should be included in the selected mechanism. Specifically, we seek comment on whether the nine density zones identified in Hatfield accurately estimate costs in an efficient network. We invite comment on how to calculate forward-looking economic costs of conduit installation and welcome data on any recent conduit installations, including conduit installed for purposes other than the construction of telephone networks.

68. Input Values. We tentatively conclude that materials and installation costs should be separately identified by both density zone and terrain type. We seek comment on the default input values that the selected mechanism should use. Any party supporting specific input values should present cost data about materials and installation supporting its position. We seek comment on the accuracy of the values in BCPM's cost tables and of Hatfield's cost multipliers, and encourage parties to submit company records or other industrial data to support their position. We seek comment on the cost of installing aerial, buried, and underground cable, regardless of whether it is used to provide telephone service, and encourage parties to submit detailed cost data on any recent cable installations. In addition, we seek comment on whether it would be possible to use national statistical averages of contractor construction prices and independent verification of the cost of installation of distribution plant to verify these costs. We also seek comment on whether a labor cost variable should be incorporated into the selected mechanism.

69. Because we also have received no documentation confirming that feeder and distribution cable installation costs should differ, we tentatively conclude that the selected mechanism will adopt Hatfield's assumption that such costs are identical. We seek comment on this tentative conclusion and encourage parties to submit documentation in support of their positions.

c. Drops

(1) Background

70. A drop is the connection between a residence or business and the distribution cable. In BCPM and Hatfield 3.1, several cost elements are combined under the general heading of drops. These cost elements include the cost of the copper or fiber loop that extends from the distribution cable to the residence or business, the terminal and splice investment, and the pedestal costs.

71. Platform Design. BCPM estimates the drop length as the distance from the corner of the residential lot to the center of the residential lot. The lot size is a function of the number of customers per square mile in each CBG. Thus, low density CBGs will have larger lots, and hence, longer drops than high density CBGs. Hatfield 3.1 assigns pre-determined loop lengths for each of seven density zones. The lengths are longer in low density areas than elsewhere. In general, the drop lengths are longer in BCPM than in Hatfield 3.1.[114]

72. Input Values. BCPM uses $0.77 per foot for drop costs, including materials and installation. Hatfield uses a cost of $0.095 per foot for aerial drop cable (two-pair) and $0.140 per foot for buried drop cable (three-pair). Hatfield uses installation costs that range from $0.23 to $0.47 per foot for aerial drops and from $0.75 to $5.00 per foot for buried drops.

73. BCPM estimates a cost of $95.98 for a six-pair aerial terminal, or about $32.00 per two-pair drop, and $157.05 for a six-pair buried terminal, or $52.35 per three-pair drop for terminal and splice investment. BCPM also estimates the cost of larger terminals, not specified in Hatfield. BCPM includes pedestal costs in drop terminal costs. Hatfield estimates the cost for terminal and splice investment at $32.00 per aerial drop and $42.50 for buried cable.

(2) Issues for Comment

74. Platform Design. We seek comment on whether the selected mechanism should estimate drop lengths or should incorporate predetermined drop length assumptions. Proponents of using the selected mechanism to generate drop-length estimates should identify the inputs and factors that the mechanism should use to estimate drop length. Parties that favor including fixed drop-length assumptions in the mechanism should identify and provide support for drop-length assumptions they advocate. We also seek comment on the accuracy of Hatfield's assumed drop lengths.

75. Input Values. Because an efficient carrier's network must include drops in order

[114] Letter from Richard N. Clarke, AT&T, to William F. Caton, FCC, dated Apr. 21, 1997 (AT&T Apr. 21 *ex parte*).

to provide the supported services, we tentatively conclude that the selected mechanism will determine the forward-looking economic cost of drops, including installation, terminal, splice, and pedestal costs. We invite comment on the accuracy of the estimated costs of these items under the proposed models.

d. Structure Sharing

(1) Background

76. Platform Design and Input Values. Structure sharing describes the practice of sharing facilities such as poles, trenches, and conduits with other utilities. BCPM assumes that an efficient telecommunications carrier will not benefit very much from sharing. BCPM's default input values assign between 50 and 100 percent of the costs of the poles and between 80 and 100 percent of the cost of trenches and conduits used by telephone companies to those companies. BCPM estimates the cost of different types of installation -- trenching, plowing, and cutting and restoring asphalt -- and the relative frequency of each type of installation. BCPM's estimate of the percentage of facilities that are shared does not vary much with respect to different installation activities or different types of terrain. The Hatfield model assumes utilities will engage in substantial sharing; for the most part, Hatfield's default input values assign between 25 percent and 50 percent of the costs of shared facilities to telephone companies. Hatfield does not use different estimates for different installation activities or for different terrain. Both models alter the percentages of costs they assume will be shared depending on the type of structure (buried, conduit, or aerial) and on the line density zone.

77. Many commenters disagree with the structure sharing assumptions in the Hatfield model.[115] Aliant Communications Co. (Aliant) states that in remote areas there will be minimal sharing, because of the distinct design parameters and costs associated with facility placement for each type of utility.[116] RTC/GVNW contend that, in remote areas, carriers often cannot share structures because few cable companies are located in these areas and electric utilities often use construction methods different from those used by telephone companies.[117] GTE comments that sharing is limited in its territory.[118] Several commenters specifically criticize Hatfield's assumptions with respect to buried cable. They indicate that Hatfield should not assume buried

[115] *See, e.g.*, National Cable Television Association (NCTA) pre-workshop comments at 3; BellSouth model comments, att. 1 at 3; SBC Communications (SBC) model comments at 23.

[116] Aliant model comments at 6.

[117] RTC/GVNW post-workshop comments at 19.

[118] GTE model comments at 72 (stating that it pays 97.5 percent of the cost for buried plant its uses, 95 to 99 percent for underground plant, and 57-61 percent for aerial plant).

cable is shared because, when cable is buried using cable plows, it cannot be shared.[119] Hatfield's proponents counter that, while under rate-of-return regulation monopoly ILECs had no incentive to engage in sharing, under competitive conditions LECs will have increased incentives to share in order to reduce costs.[120] They also indicate that municipalities are increasingly encouraging utilities to share trenching operations and pole usage in order to minimize disruption and congestion.[121] In addition, they note that the 1996 Act requires ILECs to provide nondiscriminatory access to poles, ducts, conduits, and rights-of-way.[122]

78. Sprint suggests an alternative to the values assumed by BCPM and Hatfield. Sprint suggests that, except for plowing, telephone companies should be assumed to bear 66 percent of the costs for all types of structures in all types of terrain.[123] The majority state Joint Board members make a similar proposal, suggesting that telephone companies should bear 66 percent of structure costs, with the following exceptions: telephone companies should bear 100 percent of the costs of plowing and rocky plowing, 50 percent of the costs of poles, and 100 percent of the costs of anchors and guys.[124]

(2) Issues for Comment

79. Platform Design. Because it appears that an efficient carrier would vary its sharing levels according to installation activity and terrain, as BCPM assumes, we tentatively conclude that the selected mechanism should adopt BCPM's categories for installation activities and terrain conditions. We seek comment on BCPM's estimates for the relative frequency for each type of installation activity. Because it appears that an efficient carrier would also vary its sharing levels according to line density zones, we tentatively conclude that the selected mechanism should also include line density zones in its estimates of sharing and we seek

[119] Gabel model comments at 22 (suggesting that, for buried cable, close to 100 percent of costs should be assigned to telephone, rather than the 33 percent used in the Hatfield model); RUS model reply comments at 5. A cable plow is a piece of industrial equipment used to bury cable.

[120] Letter from Richard N. Clarke, AT&T to William F. Caton, FCC, dated Mar. 18, 1997 (AT&T Mar. 18 *ex parte*).

[121] Letter from Richard N. Clarke, AT&T to William F. Caton, FCC, dated Mar. 18, 1997 (AT&T Mar. 18 *ex parte*).

[122] Letter from Richard N. Clarke, AT&T to William F. Caton, dated Mar. 18, 1997 (AT&T Mar. 18 *ex parte*); *see* 47 U.S.C. § 224.

[123] Letter from Warren Hannah, Sprint, to William F. Caton, FCC, dated Mar. 24, 1997 (Sprint Mar. 24 *ex parte*).

[124] Majority State Members' Second Report, app. at 5. Guys are wires that hold up a telephone pole, and anchors attach guys to the ground.

comment on whether, because we tentatively conclude above that Hatfield's line density zones are superior, the selected mechanism should use Hatfield's line density zones to estimate sharing. We seek comment on how BCPM's assumptions would need to be altered to accommodate Hatfield's line density zones. Commenters should provide cost data about sharing to substantiate their positions.

80. Input Values. Based on the record,[125] it appears that efficient carriers are likely to bury a significant portion of their cable using plows and that it appears that carriers cannot benefit from sharing when using cable plows. Therefore, we tentatively conclude that Hatfield incorrectly assumes that carriers benefit from sharing for such cable and that the selected mechanism will assign 100 percent of costs to the telephone company for cable that is buried using a cable plow.

81. We also tentatively conclude that Sprint's suggested value of 66 percent is an acceptable aggregate default input value for the percent of costs assigned to the telephone company for all other shared facilities. It appears that this value is a reasonable compromise between the values included in BCPM and the values included in Hatfield. Nevertheless, because we also find that the percent of sharing will vary with installation activity, terrain, and line density zone, we seek comment on the correct input values for these disaggregated categories.

82. We also seek comment on AT&T's contention that changes to the regulatory climate will increase the extent to which carriers are required or are willing to share structures. In particular, we seek comment on whether these changes will affect carriers' decisions in the near term, or whether regulatory changes will not have a significant impact on carriers' willingness to share structures for a significant time into the future. Commenters contending that such changes will increase sharing should provide support for their positions. For example, we encourage commenters to submit data detailing the extent to which federal, state and local regulation is forcing carriers to share structures.

e. Loop Design

83. The loop plant constitutes a significant part of the network cost that the models calculate. The two models, however, differ greatly in their assumptions regarding loop design and standards. For example, Hatfield calculates costs based on very long copper loops using loading coils, while BCPM includes more optical fiber in its loop design. In selecting the loop design components for the selected mechanism, we seek to implement our conclusion that the mechanism employ the least-cost, most-efficient and reasonable technology for providing the

[125] Gabel model comments at 22; RUS model reply comments at 5.

supported services[126] and the Act's provision that universal service support be sufficient.[127]

(1) Fiber-Copper Cross-over Point

(a) Background

84. Platform Design. The fiber-copper cross-over point determines when carriers will use fiber cable instead of copper cable in their feeder plant. In addition, a carrier's decision regarding the fiber-copper cross-over point will affect whether that carrier uses loading coils, because loading coils are used to extend the viable length of copper cable.

85. The Joint Board recommended that the choice between fiber and copper should reflect the least-cost method of placing loop facilities,[128] and we agreed in the Order that "the technology assumed must be the least-cost, most-efficient, and reasonable technology"[129] and that the "model must include the capability to examine and modify the critical assumptions and engineering principles . . . includ[ing] . . . fiber-copper cross-over points . . ."[130] BCPM uses a fiber-copper cross-over of 12,000 feet, i.e., it assumes that feeders of more than 12,000 feet will be fiber cables. Hatfield uses a cross-over point of 9,000 feet, i.e., feeders of more than 9,000 feet will be fiber cables. As discussed below, Hatfield assumes that copper cable may exceed 18,000 feet, while BCPM limits the copper loop to 12,000 feet. Nevertheless, neither the BCPM nor Hatfield proponents have submitted studies showing whether their cross-over points are designed to reflect the Commission's least-cost criterion. NCTA/ETI evaluated the fiber-copper cross-over algorithms used in BCPM and Hatfield 3.1.[131] Based on the other default values in BCPM (e.g., the costs of copper, fiber, and electronics), NCTA/ETI indicates that the most efficient value in the BCPM model is 18,000 feet,[132] and for Hatfield, the most efficient value is 6,000 feet. NCTA/ETI further reports that, in the Hatfield model, differences in cost between

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[126] Order at para. 250, criterion 1.

[127] 47 U.S.C. § 254(b)(5), (d).

[128] Recommended Decision, 12 FCC Rcd at 531.

[129] Order at para. 250, criterion 1.

[130] Order at para. 250, criterion 9.

[131] Letter from Teresa Pitts, NCTA, to William F. Caton, FCC, dated Mar. 27, 1997 (NCTA Mar. 27 *ex parte*), att. Susan M. Baldwin, Lee L. Selwyn, Economics and Technology, Inc. (ETI), "The Use of Cost Proxy Models to Make Implicit Support Explicit," (NCTA Mar. 27 *ex parte*, att. ETI) at 33-35. The attachment is a report prepared by ETI on behalf of NCTA assessing the BCPM and the Hatfield Model 3.1.

[132] NCTA Mar. 27 *ex parte*, att. ETI at 33-35.

the most efficient cross-over point and the default cross-over point are negligible.[133] The state Joint Board members support an 18,000 foot maximum copper distribution for the BCPM, and a 12,000 foot breakpoint for Hatfield.[134] The majority state Joint Board members assert that the BCPM loop design is superior to Hatfield's.[135]

86. In the Order we also addressed the inclusion of loading coils in the models, concluding that "the loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services."[136] Thus, we concluded that loading coils should not be used because they impede the provision of advanced services.[137] BCPM extends fiber cable further into the distribution network instead of using loading coils, while Hatfield adds loading coils to cables and would install coarser gauge copper cables for copper cable lengths over 18,000 feet.[138] NCTA asserts that BCPM could change its copper loop length from 12,000 to 18,000 feet and still model a network offering "quality" service.[139] The Hatfield proponents indicate that the Hatfield model could be modified to eliminate loading coils.[140] Hatfield indicates that its proposed modifications would not presume the installation of unnecessarily expensive fiber optic cable and terminals in sparsely-populated areas, as it contends BCPM does.[141]

(b) Issues for Comment

87. Platform Design. We tentatively conclude, based on the comments of NCTA/ETI and the recommendation of the majority state members of the Joint Board, that the BCPM

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[133] NCTA Mar. 27 *ex parte*, att. ETI at 33-35.

[134] State Members' High Cost Report at 17.

[135] Majority State Members' Second Report at 7-8.

[136] Order at para. 250, criterion 1.

[137] Order at para. 250, criterion 1. *See also* RUS model reply comments at 4 (stating that ILECs are phasing out such loops and that no new entrant would build outside plant based on that antiquated technology and that loaded loops cannot support the bandwidth for voice grade service recommended by the Joint Board).

[138] Hatfield Feb. 28 submission at 9; BCPM Jan. 31 submission, att. 9 at 116.

[139] NCTA model reply comments at 30.

[140] Letter from Richard N. Clarke, AT&T, to William F. Caton, FCC, received Apr. 29, 1997 (AT&T Apr. 29 *ex parte*). The Hatfield proponents indicated that the model would limit road cable lengths to 18,000 feet, and would serve subscriber locations beyond the 18,000-foot threshold with low-capacity remote terminals connected to "host" terminals in town clusters using T1 connections on HDSL equipment. AT&T Apr. 29 *ex parte* at 4.

[141] AT&T Apr. 29 *ex parte* at 4.

maximum cross-over default value should be set at 18,000 feet rather than 12,000 feet, and seek comment on this tentative conclusion. We seek comment on whether the BCPM fiber/copper cross-over point can also be set at 18,000 feet when the copper loop length is extended to 18,000 feet. Parties disputing NCTA/ETI's analysis should submit detailed data to support their positions. Consistent with our conclusion in the Order that the selected mechanism cannot include loading coils, as Hatfield does, we tentatively conclude that we should adopt BCPM's approach of installing optical fiber in the network to avoid loading coils.[142] We seek comment on this tentative conclusion. In the alternative, we seek comment on whether another approach, such as the one suggested by Hatfield, would be a better approach to avoid the use of loading coils in sparsely-populated areas. As discussed in more detail below, we also seek comment on the impact on the costs for digital loop carriers of our decision regarding the appropriate fiber-copper cross-over point.

(2) Loop Standards

(a) Background

88. WorldCom contends that the Commission should specify one or more loop design standards in order to create greater certainty in loop modeling process.[143] WorldCom states that the two loop standards that the Commission should consider are the Revised Resistance Design (RRD) and the Carrier Serving Area (CSA) standards.[144] The RRD permits copper loops up to 18,000 feet and will support data transmission speeds up to 1.544 mbps using xDSL technology. CSA permits copper loops up to 12,000 feet and will support data transmission speeds up to 6 mbps. Neither standard incorporates loading coils. Under either standard, using only 26 gauge copper decreases the maximum copper design lengths to only 15,000 feet and 9,000 feet respectively. WorldCom further contends that the RRD standard is consistent with the Rural Electrification Loan Restructuring Act (RELRA)'s[145] mandate that rural carriers design new loops to support 1 mbps transmission and will permit the extension of new high-speed services

[142] We note that commenters have raised issues regarding whether it is appropriate to use loading coils in extremely remote areas. *See* AT&T Apr. 29 *ex parte*, att. at 2; letter from Warren Hannah, Sprint to William F. Caton, FCC (dated Mar. 24, 1997) att. C (letter from P. Michael Henderson, Rockwell Semiconductor Systems to Rod Thompson, Sprint (dated Feb. 13, 1997)). We will address this issue when we address the development of a cost methodology for rural carriers.

[143] Letter from David N. Porter, WorldCom, to William F. Caton, FCC, dated June 6, 1997 (WorldCom June. 6 *ex parte*).

[144] WorldCom Jun. 6 *ex parte* at 2. Both standards are more fully described in the BellCore publication "BOC Notes on the LEC Networks - 1990."

[145] 107 Stat. 1356, codified in 7 U.S.C. § 935 (1994).

to all parts of the country.[146] Among the services that the RRD standard would support are Internet access, video-teleconferencing, tele-medicine, and distance learning. WorldCom contends that because the CSA standard will also enable LECs to offer video dialtone services, which would have significant commercial value, the universal service fund should not pay for LEC entry into this new market against competitors that would not receive universal service funding.[147]

(b) Issues for Comment

89. Platform design. We seek comment on whether we should adopt any loop design standards in the forward-looking economic cost mechanism. If a loop design standard is to be included, which standard - the RRD, CSA, or any another alternative - should be adopted? Because these engineering standards essentially assure the provision of a particular level of network performance, should we instead adopt a performance standard? We also seek comment on what impact the incorporation of particular design or performance standards would have on the size of the fund.

(3) Digital Loop Carriers

(a) Background

90. Digital loop carriers (DLCs) connect fiber feeder cables and copper loops. DLCs transform electric signals carried on the copper loops into optical signals carried on fiber lines and vice versa. Most large DLCs can assign multiple subscriber lines to a single electronic channel rather than assigning one channel per subscriber line.

91. Platform Design. Both Hatfield and the BCPM assume that, when they are to be used, DLCs would be one of two sizes, depending upon the number of subscriber lines connected to them. BCPM assumes the larger DLC will be used for more than 672 subscriber lines. Hatfield, by contrast, switches to the larger DLC at 384 subscriber lines, but allows adjustment of this level as a variable.

92. Input Values. Although both Hatfield and BCPM assume extensive deployment of DLCs, their cost estimates differ significantly. BCPM estimates the common cost of a large DLC at $125,121.00, plus $92.81 per line.[148] Sprint, one of BCPM's proponents, suggests

[146] WorldCom Jun. 6 *ex parte* at 2.

[147] WorldCom Jun. 6 *ex parte* at 2.

[148] BCPM Feb. 28 submission, att. 9 at 145.

changes to BCPM, including lower DLC costs "consistent with Sprint's internal costs."[149] Hatfield calculates investment associated with site and power for the remote terminal of a DLC system. For a large DLC, Hatfield uses an estimate of $66,000.00 for initial common investment, including fiber optics multiplexer; $3,000.00 for site and power; $310.00 for channel unit investment; $1,000.00 for optical patch panel; and $18,500.00 for common equipment investment per additional line investment. For all line sizes, BCPM estimates higher costs than Hatfield, with the largest differential associated with the smaller DLCs.[150] State Joint Board members assert that DLC data are inadequately documented.[151]

(b) Issues for Comment

93. Platform Design. We seek comment on the models' assumptions regarding the number of subscriber lines that should trigger the use of a large DLC. Parties should include a discussion of the differences between the two models and the reasonableness of their underlying assumptions. We also request comment on whether the models should consider use of DLCs of more than two sizes; we particularly seek comment on whether DLCs smaller than those used in the model are available and under what circumstances such smaller DLCs might be used. We also request comment on the impact of the fiber-copper cross-over on the number and size of DLCs needed in the network. For example, in some CBGs, BCPM would place multiple DLCs to serve a population spread across a large geographic area. We seek comment on whether the models should also compare the cost of extending fiber to fewer points in the CBG, placing larger DLCs at those points, and running copper to customers including the possible additional cost of repeater electronics on the longer copper loops.

94. Input Values. We seek discussion of how to calculate the forward-looking economic cost of DLCs. Parties should discuss whether the models' current inputs for these costs are reasonable, as well as Sprint's proposed BCPM modification.

f. Wireless Threshold

(1) Background

95. In the Order, we concluded that universal service support should be portable to any eligible carrier, including a wireless carrier, that provides the supported services in high cost

[149] Letter from Warren D. Hannah, Sprint, to William F. Caton, FCC, dated March 24, 1997, att. at 4.

[150] *See* Letter from Mary J. Sisak, MCI, to William F. Caton, FCC, dated Apr. 3, 1997 (MCI Apr. 3 *ex parte).*

[151] State Members' High Cost Report at 8.

areas.[152] Once the level of support a carrier will receive is determined, the carrier may use whatever technology it prefers to provide the supported services; the level of support it receives is not dependent upon the technology it uses. Both BCPM and Hatfield, however, estimate the costs of providing the supported services using engineering assumptions based on wireline technology.

96. Platform Design. In calculating the cost of providing service, BCPM attempts to account for the possibility that wireless technology may be less expensive than wireline technology, while Hatfield does not. To calculate the cost of providing service, BCPM assumes that if the loop investment for serving a single customer exceeds $10,000.00, an efficient carrier would not use wireline service, but would substitute wireless service instead. Thus, BCPM places a $10,000.00 cap on its estimate of loop investment per customer. RUS asserts that BCPM's $10,000.00 cap is unrealistic.[153] RUS claims that the most expensive wireline loops are usually far enough apart that multiple wireless systems are required to serve these customers. RUS indicates that, if each wireless system serves only a few subscribers, they are economically impractical.[154] AT&T/MCI assert that the cost of wireless loops may be greater than the $10,000.00 cap used by BCPM.[155]

97. Other commenters debate whether engineering assumptions about wireless technology should be used in the selected forward-looking economic cost mechanism. Sprint indicates that cost data for wireless telecommunications are too limited to include in the selected mechanism.[156] The Majority State Members Second Report asserts that a wireless cap should not be used at this time.[157] In contrast, American Personal Communications (APC) and Cellular Telecommunications Industry Association (CTIA) claim that wireless technology may have lower per-subscriber costs in some areas than the costs determined by forward-looking economic

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[152] Order at paras. 286-88. By "eligible" carrier we refer to any carrier that satisfies the requirement of section 214(e) of the Act. Section 214(e) requires that any carrier designated as an eligible carrier must, throughout its service area: (1) offer the services which are supported by federal universal service support mechanisms under section 2549c); (2) offer such services using its own facilities or a combination of its own facilities and resale of another carrier's services, including the services offered by another eligible telecommunications carrier; and (3) advertise the availability of and charges for such services using media of general distribution. 47 U.S.C. § 214(e).

[153] RUS model reply comments at 3 (stating that most of the carriers that borrow from RUS have some loops that require investment over $10,000.00 and that it has found only a few instances where wireless loop plant is cheaper than wireline).

[154] RUS model comments at 4.

[155] AT&T/MCI model comments at 13.

[156] Sprint model comments at 12.

[157] Majority State Members' Second High Cost Report at 8.

cost model calculations.[158] They argue that failure to incorporate wireless technology into the models artificially inflates cost estimates, thus leading to unnecessarily high assessments for contributing carriers.[159] Nortel claims that recent deployments of fixed wireless access systems show declining costs for wireless loops.[160]

(2) Issues for Comment

98. Platform Design. In light of RUS's contention that wireless service does not necessarily cost less than $10,000.00 per loop, we seek comment on whether the cost of a loop should be capped at $10,000.00 in all cases. We seek comment, however, subject to the discussion below, on whether the selected mechanism should include a cap, and on the level of such a cap, if a cap is necessary to reflect the lower costs of wireless technology.

99. We agree with the wireless commenters that, to the extent practical, the selected mechanism should estimate the cost of providing the supported services using wireless technology in areas where wireless technology is likely to be the least-cost, most efficient technology. We note, however, that we have received almost no information regarding how to estimate such costs, or the criteria that the selected mechanism should use to determine whether wireline or wireless service is more economical. Thus, we seek comment on the feasibility of including an additional component in the mechanism that would compare the cost of providing service via a wireless network with the cost of providing service via a wireline network and would choose the lowest-cost technology to calculate the costs of providing the supported services. We seek comment on whether, because wireless companies must currently determine whether it is economical for them to enter a particular market, wireless companies have already developed such models.[161] We strongly encourage commenters supporting the inclusion of engineering assumptions regarding wireless technology in the mechanism to submit models or other assumptions that they believe should be included. We further encourage commenters to submit data about the cost and types of wireless networks and their components in support of their suggestions, and remind commenters that any wireless component that might be added to the selected mechanism must also meet the Commission's criteria.[162]

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[158] CTIA comments at 7; APC reply comments at 3.

[159] CTIA comments at 7; APC reply comments at 3. *See also* Northern Telecommunications (Nortel) comments at 5.

[160] Nortel comments at 5.

[161] *See also, e.g.,* David Gabel & D. Mark Kennet, "The Effect of Cellular Service on the Cost Structure of a Land-Based Telephone Network," 14 NRRI QUARTERLY BULLETIN 17 (Winter 1997). A more recent version of this paper can be found at: http://www.ctr.columbia.edu/citi/wireless/gabelpap.html.

[162] Order at paras. 249-50.

100. We note that BCM was first filed with the Commission in December 1995. We seek comment on the length of time necessary to develop a mechanism that compares the cost of wireless engineering with the cost or wireline engineering. Specifically, we seek comment on whether modeling wireless technology would be less complex than modeling wireline technology, and therefore whether a wireless platform could be developed by December 1997, and a complete mechanism, including inputs, by August 1998, in accordance with the Commission's schedule. In the alternative, we seek comment on whether the development of a competitive bidding mechanism would be a better way to capture the differing costs between wireline and wireless technology.[163]

101. Because we are uncertain that we can develop a mechanism that includes the cost of wireless technology within the Commission's schedule, we seek comment on whether basing support amounts on the cost of wireline technology will be consistent with section 254 and with the Commission's universal service goals. Because parties contend that wireless technology may be cheaper than wireline technology, we tentatively conclude that providing support based on the cost of a wireless network to provide the supported services would meet the statutory directive that support be "sufficient."[164] We seek comment on this tentative conclusion. We also seek comment on whether basing support solely on wireline costs, when wireless technology may offer a less expensive option, would be consistent with the Commission's conclusion that the mechanism should use the least-cost, most-efficient, and technology available.

102. As a separate but related issue, we seek comment on whether the models should include assumptions that would consider microwave, satellite, or other non-wireline technologies in situations where such technologies could allow the provision of universal service more cost-effectively than wireline technology.

g. Miscellaneous Outside Plant Input Value Issues

103. The following components of outside plant do not affect the structure of the models; for them the only issue is what input values we should use.

(1) Manholes

104. Background. Underground installations require manholes. BCPM and Hatfield calculate similar manhole costs. BCPM's cost estimates range from $4,583.00 to $6,440.00 for materials and labor, with no separate enumeration of costs for delivery, excavation, and backfill. Hatfield's costs -- including materials, delivery, excavation, and backfill -- range from $5,140.00 to $7,340.00 per manhole (depending on the population density zone).

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[163] We will consider competitive bidding in detail in a later proceeding.

[164] 47 U.S.C. § 254(e).

105. Issues for Comment. We seek data demonstrating the forward-looking economic cost of manholes for inclusion in the selected mechanism. In light of the similarities in the two models' input values, we seek comment on whether these data are accurate and how the differences between the input values may be reconciled. Parties should submit documentation in support of their suggested input values.

(2) Poles, Anchors, Guys, Aerial Cable, and Building Attachments

106. Background. The BCPM estimates significantly higher costs for pole materials and installation than Hatfield 3.1. For example, BCPM uses an input value for pole costs of $368.17, but Hatfield uses an input value for a 40 foot Class 4 southern pine pole of $201.00. BCPM's installation costs range from $358.58 to $558.58, depending upon terrain. In contrast, Hatfield assigns a constant labor cost of $216.00, regardless of terrain, and it is not clear whether other installation costs, besides labor costs, are included in that figure.

107. BCPM states that guys[165] and anchors[166] together cost $68.00 for materials, and assigns $255.00 to $310.00 for installation. Hatfield does not include separately identified user input values for anchors and guys. BCPM does not include riser cable (cable attached to high-rise buildings), but Hatfield establishes a per-foot cost for riser cable, which includes installation costs.

108. Both models use similar pole spacing assumptions that are based on density zones. Both models place poles 250 feet apart in less dense areas, and 150 feet apart in the densest areas, though the two models' density zone assumptions are different.[167]

109. Cable costs vary widely between the BCPM and Hatfield models. BCPM uses cost tables for aerial, underground, and buried cable that estimate cable costs at $1.00 to $61.78 per foot. Hatfield's cable costs range from $1.19 to $74.25 per foot, with no distinction between costs for aerial, buried, and underground cable. BCPM's aerial cable costs are similar to Hatfield's cable costs.

110. Issues for Comment. We seek comment on what the accurate input values should be for the forward-looking economic cost of materials and installation for poles. We seek comment on the reasonableness of the type of materials chosen by each model. We also seek comment on whether installation costs for poles should vary with terrain. Commenters should submit cost documentation in support of their suggested input values.

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[165] Guys are wires that hold up a telephone pole.

[166] Anchors are wires that attach the guys to the ground.

[167] *See supra* section III.C.2.b. for a discussion of the two models' density zones.

111. We also seek comment on whether BCPM's materials and installation cost estimates for anchors and guys are accurate, and whether Hatfield's pole materials and installation costs are sufficient to cover the cost of anchors and guys. We also seek comment on whether the selected mechanism should identify separately costs for poles, guys, and anchors. Parties should submit cost data in support of their suggested input values.

112. Because both models include them, we tentatively conclude that the selected mechanism should include pole spacing input values. We seek comment on this tentative conclusion and on the pole spacing input values that we should use. In light of the models' similar input values, we seek comment on whether the models' input values for these costs are accurate or on whether averaging the two sets of input values would provide an accurate calculation of these costs. Commenters should submit cost documentation in support of their suggested input values.

113. We tentatively conclude that the selected mechanism should include feeder and distribution cable costs for both copper and fiber. We seek comment on the forward-looking costs of copper and fiber cable. We specifically seek comment on whether, as the BCPM proponents contend, buried cable and underground cable[168] are less expensive than aerial cable. Commenters should submit cost documentation in support of their suggested input values.

(3) Network Interface Devices

114. Background. A network interface device (NID) is a device that connects the wiring that belongs to a customer, and is located inside a customer's premises, to the loop facilities outside a customer's premises. A protection block is installed with the NID to protect customers' wiring from electrical surges caused by lightning or other electrical disturbances that affect loop facilities belonging to the telephone company. BCPM assigns a cost of $30.73 per NID, and does not distinguish between residential and business connections. Hatfield assigns $25.00 per residential NID, which, it assumes, can handle up to six lines, plus $4.00 per line for each protection block. For business NIDs, Hatfield assigns $40.00, plus $4.00 per line for each protection block. Therefore, in Hatfield, a single line residence NID costs $29.00 and a single-line business NID costs $44.00.

115. Issues for Comment. We tentatively conclude that we should prescribe NID costs in the selected mechanism. We tentatively conclude that Hatfield correctly separates the cost of protection blocks from the cost of the NID, and correctly distinguishes between the cost of a residential NID and a business NID, and that the selected mechanism should incorporate these distinctions. We seek comment on our tentative conclusions, and on the correct input values that should be used for NID and related costs. Such comments should be supported with cost data wherever possible.

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[168] On the distinction between buried and underground cable, *see supra* section III.C.2.a.(1).

(4) Service Area Interfaces

116. Background. The Service Area Interface (SAI) is the physical interface between distribution and feeder cable. The SAI is usually located outside buildings, but is located inside buildings when the feeder plant terminates in the basement of a high-rise building. Hatfield estimates the cost of investment and installation for SAI for cable sizes ranging from six to 2400 lines. For example, Hatfield estimates the cost of investment and installation of SAI for size 2400 cable inside buildings at $1,052.00, and outdoor SAI investment at $4,469.00. The BCPM assigns much higher costs and makes no indoor/outdoor distinction. For example, the estimated cost for SAI with size 2401 cable is $20,430.00.

117. Issues for Comment. We tentatively conclude that the selected mechanism should include the cost of SAI for various cable sizes, and should assume different costs for indoor and outdoor cable as Hatfield does. We seek comment on our tentative conclusion. In light of the wide disparities in SAI costs assigned by the mechanisms, we seek comment on the forward-looking economic costs of SAIs, and encourage parties to submit additional data on these costs.

(5) Fill Factors and Utilization

118. Background. A cable fill factor is the percentage of the total usable capacity of cable that is expected to be used rather than the amount available in reserve. If cable fill factors are set too high, the cable will have insufficient capacity to accommodate small increases in demand or service outages. In contrast, if fill factors are set too low, the resulting excess capacity increases the models' cost estimates to levels higher than an efficient firm's costs, resulting in excessive universal service support payments and encouraging entry by inefficient firms. The current models differ in their default fill factors. BCPM distribution cable fill factors range from 40 to 75 percent, but Hatfield ranges from 50 to 75 percent. For copper feeder cable, BCPM's fill factors range from 75 to 85 percent; Hatfield's range from 65 to 80 percent. In both models, default fill factors differ by density zone.

119. Issues for Comment. We note that, over time, the models' estimates for fill factors have converged. We seek comment on the fill factor that should be used for the selected mechanism. In light of the similarities between the models, we seek comment on whether their input values are accurate and how the differences between the values may be reconciled. We encourage parties to submit engineering data or other relevant documentation in support of the fill factor that they favor.

h. Dates for Comments on Outside Plant Investment

120. As discussed in section III.B.2, interested parties may file comments regarding the design of the outside plant investment components, including the algorithms determining plant mix, installation and cable costs, drop lengths, structure sharing, the fiber-copper cross-

over point, digital loop carriers, and the wireless threshold (sections III.C.2.a - g), on or before September 24, 1997, and reply comments on or before October 3, 1997.[169] Interested parties may file comments regarding all input values regarding outside plant input investment on or before October 17, 1997, and reply comments on or before October 27, 1997.[170]

3. Switching

a. Mix of Host, Stand-Alone, and Remote Switches

(1) Background

121. Platform Design. Switches can be designated as either host switches, stand-alone switches, or remote switches. Both a host switch and a stand-alone switch can provide a full complement of switching services without relying on another switch. A remote switch relies on a host switch to supply a complete array of switching functions and for interconnection with other switches. Proponents of both models claim that they detect no difference in switching costs based on the type of switch used, and therefore their models do not distinguish among the different switch types.[171] A review of 1996 depreciation filings, however, shows that large ILECs are purchasing fewer host switches and more remote switches.[172] Suggesting that choices about switch type could affect the total cost computed more than the models currently suggest, the Joint Board expressed concern that the models did not distinguish among types of switches.[173]

(2) Issues for Comment

122. Platform Design. Based on the Joint Board's concern, we tentatively conclude that the selected mechanism should include an algorithm that will place host switches in certain wire centers and remote switches in other wire centers. Based on ILECs' decisions, as revealed in the depreciation filings, to deploy more remote switches, we tentatively conclude that the

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[169] *See infra* app. A, Comment Submission Schedule.

[170] *Id.*

[171] BCPM Jan. 31 submission; Hatfield Jan. 7 submission.

[172] Staff analysis of the depreciation rate studies submitted in 1996 to the Competitive Safeguards Branch, Accounting and Audits Division, Common Carrier Bureau, Federal Communications Commission, 2000 L Street, NW, Rm. 257, Washington, DC, 20554. Before an ILEC changes the depreciation rates applicable to its operated plant, it must file a report with the Commission pursuant to 47 C.F.R. § 43.43. ILECs generally submit depreciation rate studies to the Commission prior to filing such reports.

[173] Recommended Decision, 12 FCC Rcd at 532-533.

host-remote arrangement is more cost-effective in many cases than employing stand-alone switches. We seek comment on this tentative conclusion, and urge parties to provide engineering and cost data to demonstrate the most cost-effective deployment of switches in general and host-remote switching arrangements in particular. We also seek detailed comment describing how to design an algorithm to predict this deployment pattern. We seek comment on how to obtain information that would verify or refute the assertion of the models' proponents that there is no cost difference between host switches and remote switches.

b. Capacity Constraints

(1) Background

123. Platform Design and Input Values. BCPM does not include any switch capacity limitations. The BCPM cost estimate for Texas, for example, included 22 switches that served more than 80,000 lines.[174] In contrast, Hatfield 3.1 includes a number of switch-capacity constraints. It limits the number of lines one switch can serve to 80,000. It limits the processing capacity of a switch to 600,000 busy-hour call attempts (BHCA) and traffic capacity to 1,800,000 busy-hour hundred call seconds (BHCCS). If any of these limits are reached in a wire center, the model will place another switch in that wire center.[175]

(2) Issues for Comment

124. Platform Design and Input Values. We tentatively conclude that the selected mechanism should assign more than one switch to a wire center whenever the mechanism predicts that any one of a set of capacity constraints would be exceeded. We seek comment on this tentative conclusion and on what capacity constraints the selected mechanism should adopt. Parties are encouraged to provide technical data to support any proposed capacity constraints.

c. Switch Costs

(1) Background

125. In the Order, we agreed with the state members of the Joint Board that estimating the switching investment cost is a significant unresolved problem of the cost models.[176] Proponents of the models are apparently having difficulty acquiring accurate estimates of switch

[174] BCPM Jan. 7 submission att. 3 at 1-11.

[175] Hatfield Feb. 28 submission at 43.

[176] Order at para. 244.

costs because of the lack of public information on those costs.[177] The Joint Board concluded that the convergence of the models' switch cost estimates should alleviate this lack of information[178] The state members of the Joint Board also noted that a small number of unusually high cost switches raised the BCPM switch input values.[179] They urged the Commission and its staff to perform additional analysis and to obtain more reliable switch cost information.[180]

126. Input Values. BCPM switching cost estimates are based on the results of a survey of large ILECs that asked ILECs to report the switching costs they use as inputs for ILEC Switching Cost Information System (SCIS)[181] model runs. BCPM model proponents estimated a switching curve based on the answers to the survey. The estimated per-line cost of a switch approaches $228.00 per line as the switch size reaches 80,000 lines.[182] This estimate is significantly higher than the $100.00 per-line cost used in the predecessor to the BCPM.[183]

127. The Hatfield 3.1 model combines public information and information from other unnamed industry sources to develop switching cost estimates. The model proponents fit a logarithmic curve to three data points to determine the relationship between switch-cost per line and switch-line size. This curve predicts a $74.00 per line cost for very large switches that approach 80,000 lines.[184] This result is approximately equal to the $75.00 per-line estimate used in the Hatfield 2.2.2 model.[185] Hatfield 3.1 reduces the per-line cost of the switch below the

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[177] *See, e.g.*, AT&T/MCI model comments at 19; NCTA reply comments at 41.

[178] Recommended Decision, 12 FCC Rcd at 532-533.

[179] State Proxy Model Report, app. B at 23.

[180] State Proxy Model Report, app. B at 23.

[181] SCIS is a computerized switching cost model owned by Bellcore that ILECs have used to establish the costs and prices of certain switch-related services in state proceedings and before the Commission. *See, e.g.*, 800 Database Access Tariffs and the 800 Service Management System Tariff; Provision of 800 Services, *Report and Order*, CC Docket Nos. 93-128 and 86-10, FCC 96-392 (rel. Oct. 28, 1996); Open Network Architecture Tariffs of US West Communications, Inc., *Memorandum Opinion & Order*, 11 FCC Rcd 5125 (1996).

[182] BCPM Jan. 31 submission, att. 4 at 34-40.

[183] Letter from Glenn Brown, U S West, to William Caton, FCC, dated Sep. 4, 1996 (U S West Sep. 4 *ex parte*).

[184] Hatfield Feb. 28 submission at 46.

[185] Letter from Richard N. Clarke, AT&T, to William Caton, FCC, dated Sep. 10, 1996 (AT&T Sep. 10 *ex parte*).

logarithmic curve by assuming more efficient use of trunk and line cards.[186] Hatfield 2.2.2 made a similar adjustment for trunk costs, but did not include an adjustment for the placement of line cards in DLC equipment.[187]

128. The majority of the state members of the Joint Board recommended that switch investment cost should include a fixed-cost input value of $150,000 and a per-line cost value of $110.00.[188] Aliant and Sprint suggested that the Commission should send a data request to ILECs and switch vendors to obtain accurate switch costs information.[189] BellSouth and GTE recommended using the Bellcore Switch Cost Information System (SCIS) to obtain switch cost information for use in the models.[190] Sprint also suggested that the Commission use the default input values for switch costs included in the BCPM predecessor, BCM2, until the Commission has completed an analysis of switching costs.

129. Pursuant to the Joint Board's recommendation, Commission staff examined information regarding switching costs from several sources. First, the staff obtained information from the RUS on switch purchases by RUS borrowers in 1995. The staff's statistical analysis of this information shows that the per-line cost for a 4,000 line switch is $157.75. Extrapolating the regression results to larger switches generates an estimate of $139.00 per line for an 80,000-line switch.[191] Second, the staff reviewed data filed by NECA regarding the investment in account 2210, switching investment.[192] While this investment is an accounting value recorded on the books and records of the carriers and therefore should not be used as an input of the models, the summary table can be used to evaluate the reasonableness of the models' assumption that switching costs per line decline as the size of a telephone company's study area increases.[193] These data support the models' assumptions, and imply that the current switching costs of small companies should be higher than the current switching costs of large companies.

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[186] Hatfield Feb. 28 submission at 42-46.

[187] Hatfield Sep. 10 submission at 25.

[188] Second State Members' Proxy Model Report, Majority, app. A at 3.

[189] Aliant model comments at 6; Sprint model comments at 9.

[190] BellSouth model comments, att. 1 at 3; GTE model comments at 84.

[191] *See* Public Notice, Commission Staff Analysis of Forward-looking Economic Cost Proxy Models, DA 97-56 (rel. Jan. 9, 1997) (Staff Analysis of Cost Models).

[192] 47 C.F.R. § 32.2210.

[193] Letter from Kathryn Falk, NECA, to William F. Caton, FCC, dated March 13, 1997 (NECA March 13 *ex parte*) at 2; *see* app. A.

130. Third, Commission staff obtained information on switch investment from ILEC depreciation studies. These studies include listings of the dates switches were installed, the number of lines served by each switch, and the gross investment in each switch. The staff's statistical analysis of this information indicates that the 1995 fixed cost of a switch was $185,374.00 and the 1995 per-line cost is $107.00.[194]

131. In additional, the Commission and interested parties might consider statements made by members of industry regarding switching costs. For example, Southwestern Bell-Texas (SWBT) testified in a recent state telephone investigation that it has received switch bids of $85.00 per line (engineered, furnished, and installed), and that state taxes increase SWBT's cost to $109.00 per line. SWBT's testimony states that SWBT's average cost per line for an additional line on an existing switch -- a "growth line" -- is $248.00.[195]

(2) Issues for Comment

132. Input Values. We tentatively conclude that the selected mechanism should incorporate the Commission staff's estimates of switching costs[196] because these estimates are based on filings with the Commission that record actual ILEC switch purchases. We seek comment on this tentative conclusion. We also seek comment on whether there is an alternative data source for these costs that would provide a better estimate of the current cost of switches. We also seek comment on the reasonableness of using the default input values from BCM2, as suggested by Sprint. In addition, we seek comment on whether we should incorporate the cost of growth lines into our switching cost estimate and, if so, how we should incorporate these costs, and what data sources we should use for the cost of growth lines.

d. Percent of Switch Assigned to Port and to Provision of Universal Service

(1) Background

133. Platform Design and Input Values. The models differ with respect to the percentage of switch costs they assign to the port and the percentage of switch costs that is assigned to the provision of universal service. The models divide the switch investment between

[194] *See* Staff Analysis of Cost Models.

[195] Direct Testimony of Hugh W. Raley, Southwestern Bell Telephone Company, Dockets Nos. 16189, 16196, 16226, 16285, 16290, before The Public Utility Commission of Texas, at 7.

[196] As noted above, these estimates are based on ILEC depreciation studies and show that the 1995 fixed cost of a switch was $185,374.00 and the 1995 per-line cost was $107.00.

two basic functions: port and usage.[197] The Joint Board suggested that the Commission review the percentage of switch costs that the models assign to the provision of universal service.[198]

134. BCPM uses local-usage dial equipment minutes (DEM) to divide switch costs between the costs of providing universal service and the costs of providing all other services. In contrast, Hatfield 3.1 assigns 30 percent of switch cost to port costs and assigns all of the port costs to the cost of providing universal service. Hatfield further divides the 70 percent of switch cost it assigns to usage between local traffic and toll traffic on the basis of conversation minutes and includes the cost of local traffic in the cost of universal service.[199] The BCPM proponents state that both models could be adjusted so that they assign less than 100 percent of local usage to the provision of universal service, and vary the portion of traffic sensitive access usage assigned to the provision of universal service.[200]

(2) Issues for Comment

135. Platform Design and Input Values. We tentatively conclude that switch costs should be divided between line-side port and usage costs. This would be consistent with our decision in the *Access Charge Reform Order* to make this same distinction in access charges,[201] and also is most consistent with our decision in the Order to support only non-traffic sensitive costs associated with access to interexchange service.[202] We tentatively conclude, however, not to adopt either of the models' assumptions regarding the percentage of the switch investment that is associated with the port. We seek comment on these tentative conclusions and on whether we can use the information that ILECs must file in response to our *Access Charge Reform Order* to determine the percentage of the switch investment to be allocated to the port function.[203] We also seek comment on a reasonable percentage of switch costs to include in the port function.

136. In light of the difficulty in obtaining information on switching costs and the

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[197] In our *Access Charge Reform Order*, we defined the line-side port to include the line card, the protector, and the main distribution frame. *Access Charge Reform Order* at para. 125.

[198] Recommended Decision, 12 FCC Rcd at 532-533.

[199] Hatfield Feb. 28 submission at 27-28.

[200] BCPM Jan. 31 submission, att. 9, app. B, at 8.

[201] *See* Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, End User Common Line Charges, CC Docket No. 96-262, 94-1, 91-213, 95-72, *First Report and Order*, FCC 97-158, (adopted May 7, 1997) (*Access Charge Reform Order*) at para. 125.

[202] Order at para. 76.

[203] *See Access Charge Reform Order* at para. 128.

proportion of the switch to be included in the port function, we seek comment on whether the Commission should undertake a detailed engineering study of several of the large host switches currently being deployed by ILECs (such as the Nortel DMS-100 and the Lucent 5ESS) and associated remote switches and smaller switches (such as the Nortel DMS-10) to ascertain what portions of the switch equipment are associated with the port function. We seek comment on whether such an engineering study could result in useful information about the portions of switch that are associated with the port function and the costs of that equipment. We also seek comment on whether alternative data sources are available for the purpose of estimating current switching cost. If so, we seek comment on how to obtain and use that information.

137. We tentatively conclude that all of the port cost and a percentage of the usage cost are costs of providing universal service. We tentatively conclude that the percentage of the usage cost that should be assigned to the cost of providing universal service should be determined by the amount of local usage included in the definition of supported services that we will adopt, as a percentage of total usage that the model predicts on the network.[204] We seek comment on these tentative conclusions.

e. Dates for Comments on Switching

138. As discussed in section III.B.2, interested parties may file comments on the platform design relating to switching on or before August 8, 1997, and reply comments on or before August 18, 1997.[205] Interested parties may file comments on the input values relating to switching on or before October 17, 1997, and reply comments on or before October 27, 1997.[206]

4. Interoffice Trunking, Signaling, and Local Tandem Investment

a. Background

139. We recognize two uses for interoffice trunking, signaling, and local tandem facilities: (1) the completion of local calls and (2) transport to an IXC point of presence (POP). Because transport for interexchange service is not a supported service,[207] the selected mechanism will estimate only the cost of interoffice trunking, signaling, and local tandem facilities used for the completion of local calls.

140. Platform Design and Input Values. BCPM employs a simple multiplier to

[204] *See infra* section VI.

[205] *See infra* app. A, Comment Submission Schedule.

[206] *Id.*

[207] Order at para. 76.

estimate the portion of total interoffice trunking, signaling, and local tandem costs that should be attributed to supported services. The multiplier is a percentage of switch investment. Hatfield treats these facilities on a more disaggregated basis. Hatfield assigns different ratios for different types of interoffice trunking, signaling, and local tandem facilities based on its assumptions with respect to traffic, routing, and the total mix of access lines served by each switch. Hatfield assumes that, except for wire centers with fewer than 5,000 lines, all interoffice facilities consist of SONET fiber rings, and Hatfield treats access facilities for IXC POPs separately. Hatfield allows the interoffice facilities used to complete local calls to share structures[208] with interoffice facilities used to carry traffic to IXCs, and it apportions the cost of these structures between these two functions according to a user-defined sharing percentage. Both models allow the user to alter the input values to their transport equations.

b. Issues for Comment and Comment Dates

141. Platform Design and Input Values. Because interoffice trunking, signaling, and local tandem facilities are an integral part of the network necessary to provide the supported services, we tentatively conclude that the selected mechanism should calculate specific cost estimates for the interoffice elements necessary to provide these functionalities.[209] Because Hatfield's platform design can generate cost estimates at this level of specificity, but BCPM's cannot, we tentatively conclude that only Hatfield's platform is currently adequate in this regard. We seek comment on this tentative conclusion and on the accuracy of Hatfield's transport algorithm. We also seek comment on the accuracy of the specific interoffice trunking, signaling, and local tandem input values proposed by Hatfield 3.1. As discussed in section III.B.2, interested parties may file comments on these design issues on or before August 8, 1997, and reply comments on or before August 18, 1997.[210] Interested parties may file comments on the issues relating to input values on or before October 17, 1997, and reply comments on or before October 27, 1997.[211]

5. General Support Facilities

a. Background

[208] As discussed above, structure sharing refers to the practice of sharing facilities such as poles, trenches, and conduits. In section III.C.2.d, however, we discuss structure sharing between telecommunications carriers and other utilities. In this case, we refer to structure sharing between facilities used to provide supported services and other telecommunications facilities.

[209] Aliant model comments at 7.

[210] *See infra* app. A, Comment Submission Schedule.

[211] *Id.*

142. General support facilities (GSF) include the investment and expenses related to vehicles, land, buildings, and general purpose computers. General purpose computers comprise the largest share of the investment and expenses in this category; buildings also comprise a large share. GSF investments are recorded in Part 32 accounts 2110 - 2124, and GSF expenses are recorded in accounts 6110 - 6124.

143. Platform Design. BCPM computes investment in the GSF category for items other than buildings as a percentage of all other plant investment. Building investment is computed as a percentage of switching equipment investment. BCPM sets GSF expenses at a fixed amount per line based on data from its ILEC surveys.[212]

144. Hatfield also segregates some buildings from the GSF category in computing GSF investment but, instead of segregating all buildings as BCPM does, Hatfield only segregates buildings that house switches (i.e., wire center buildings). To compute GSF investment *not* related to wire center buildings that house switches, Hatfield uses ARMIS data to compute a ratio of ILECs' GSF investment to ILECs' total-plant-in-service investment. This ratio is then applied to the total-plant-in-service investment that the model computes to arrive at the amount of GSF investment not related to wire center buildings. For investment in wire center buildings, Hatfield uses a table of values based on a set number of square feet per switch in use and number of lines served. For GSF expenses, Hatfield uses the ARMIS ratios described above to reach an expense amount.

145. In response to the Commission's notice on access charge reform,[213] AT&T contended that the allocation of embedded GSF expenses, including general purpose computer expenses, results in the inappropriate support through regulated access charges of ILECs' billing and collection services, which are nonregulated interstate services.[214] We concluded in our *Access Charge Reform Order* that the current allocation of GSF costs enables ILECs to recover through regulated interstate access charges costs associated with the ILECs' nonregulated billing and collection functions.[215] We also tentatively concluded that such costs should not be

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[212] BCPM Jan. 31 submission, att. 10 at 155-57. *See supra* section III.B.2.e.

[213] Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, End User Common Line Charges, CC Docket No. 96-262, 94-1, 91-213, and 95-72, *Notice of Proposed Rulemaking, Third Report and Order and Notice of Inquiry*, 62 Fed. Reg. 4,670 (rel. Dec. 24, 1996) (*Access Charge Reform NRPM*).

[214] *Access Charge Reform Order* at para. 411; AT&T Comments to *Access Charge Reform NPRM* at 67-68, app. E at 2.

[215] *Access Charge Reform Order* at para. 407. The costs of providing interstate billing and collection service are not, however, treated as unregulated in the Part 64 cost allocation process. Instead, the nonregulated billing and collection costs are identified through the Part 36 and Part 69 cost allocation process. The separations process

recovered through regulated access charges and sought comment on two options for removing such costs from regulated services.[216] Similarly, universal service support should only provide support for the regulated costs of local exchange service.

146. Input Values. BCPM assumes a default ratio of GSF to all other plant investment equal to approximately five percent, but this ratio can be changed by the user.

147. The majority state Joint Board members argue that land and building costs should not be related to switch costs, as in the BCPM, or line counts, as in the Hatfield model. Rather, the majority state members argue that the historical cost of land and buildings should be "adjusted to reflect forward-looking cost."[217]

b. Issues for Comment and Comment Dates

148. Platform Design and Input Values. We request comment on the appropriate platform assumptions to compute GSF investment and expenses. We seek comment on how we may remove costs for nonregulated activities from costs for regulated activities to incorporate the appropriate amount of GSF investment and expenses into a forward-looking mechanism. We also seek comment on whether a more accurate GSF computation would depend on factors tied to the cost of computers, because much GSF investment and expense is for general purpose computers. Assuming GSF investment is tied more closely to computer costs, we also seek comment on whether the selected mechanism should account for the increasing use of computers by businesses generally. Also, because a large share of GSF expense is attributable to the cost of land, we tentatively conclude that GSF expenses should vary by state with reference to differences in land values. We request comment on this tentative conclusion. Commenters should critique the assumptions regarding GSF investment and expenses that are currently included in BCPM and Hatfield. Commenters advocating a platform that requires an input ratio to calculate GSF expenses should discuss what that input ratio level should be, and provide supporting cost data if possible. As discussed in section III.B.2, interested parties may file comments on these issues on or before October 17, 1997, and reply comments on or before October 27, 1997.[218]

6. Depreciation

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allocates these costs to the various separations categories based on the separations of plant specific expenses, plant non-specific expenses, and customer operations expenses. *Access Charge Reform Order* at para. 410.

[216] *Access Charge Reform Order* at paras. 407-418.

[217] Majority State Members' Second Report at 12-13.

[218] *See infra* app. A, Comment Submission Schedule.

a. Background

149. Economic depreciation measures the periodic reduction in the market value of an asset over time. In the Order, we concluded that to calculate depreciation expense the selected mechanism and state cost studies must use economic lives and future net salvage percentages within the range currently authorized in the Commission's rules.[219] Commission-authorized depreciation lives are not only estimates of asset physical lives, but also reflect the impact of obsolescence, and therefore are appropriate measures of depreciation. We also stated in the Order that we shortly intend to issue a notice of proposed rulemaking to examine further our depreciation rules.[220]

150. Input Values. When calculating depreciation expenses, the models do not simulate the periodic reduction in the market value of the assets. Rather, they use "adjusted projected lives" to recover the current costs of the assets. Under this approach, the annual depreciation charges associated with an asset are computed by dividing the asset's current cost by its adjusted projected life.[221] A shorter life will increase the annual depreciation expense.

151. Commenters disagree on the depreciation rates to be used as inputs to the models. Bell Atlantic and NYNEX (BANX) state that proxy model advocates cannot "have it both ways," by basing costs on an ideal competitive network, while basing depreciation on a method that makes sense only for a rate-of-return regulated monopoly.[222] BANX assert that the models must employ accelerated depreciation methods.[223] Other commenters agree that the models should use depreciation factors used by competitive firms.[224] Some commenters assert that shorter adjusted projected lives reflect realistic economic lives.[225] They also argue that current regulatory depreciation methods project excessively long asset lives and therefore generate a reserve deficiency, that they underestimate the cost of providing telecommunications, and that

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[219] Order at para. 250.

[220] Order at para. 250.

[221] The adjusted projected life of an asset is its projected life adjusted by its future net salvage value. The projected life is the expected service life at installation, reflecting not only the physical life of the equipment, but also the obsolescence associated with the replacement of older equipment with equipment that uses new technologies.

[222] BANX model comments at 11.

[223] BANX model comments at 11.

[224] *See, e.g.*, Aliant model comments at 7; MFS Communications Company (MFS) model comments at 30; GTE model reply comments at 17.

[225] BANX model comments at 11-12; GTE model reply comments at 16.

they do not reflect the impact of competition.[226]

b. Issues for Comment and Comment Dates

152. Input Values. In light of our conclusion that depreciation should be computed within the range specified in our rules, we tentatively conclude that we should adopt, as an input to our forward-looking cost mechanism, depreciation expenses that reflect a weighted average of the rates authorized for carriers that are required to submit their rates to us. We request comment on this tentative conclusion. Further, we seek comment on whether adjusted projected lives should reflect the asset lives of facilities and equipment dedicated to providing only the supported services or whether the asset lives should reflect a decision to replace existing plant with plant that can provide broadband services.[227]

153. As noted in the Order, we intend to issue a notice of proposed rulemaking in the near future to consider changes to the Commission's depreciation rules. We cannot be certain, however, that our new rules will be effective in time for states to incorporate them in their cost studies, which they must file in February 1998. Accordingly, we tentatively conclude that we should use the range prescribed in the Commission's current rules for purposes of this proceeding, with the understanding that we may adjust the depreciation inputs to our mechanism in light of the outcome of our depreciation rulemaking. We seek comment on this tentative conclusion, and also on whether the states also should be permitted to adjust their cost studies to incorporate any changes to our depreciation rules. In addition, we ask parties to discuss how the inclusion of depreciation rates in the selected mechanism would be affected by changes in the Commission's depreciation rules.

154. As discussed in section III.B.2, interested parties may file comments on these issues on or before October 17, 1997, and reply comments on or before October 27, 1997.[228]

7. Expenses

a. Expenses in General

(1) Background

155. Platform Design. BCPM estimates expenses on a per-line basis. These estimates

[226] BANX model comments at 11-12; GTE model reply comments at 16.

[227] Lawrence K. Vanston, *Transforming the Local Exchange Network* (1994).

[228] *See infra* app. A, Comment Submission Schedule.

are derived from a survey of ILECs.[229] This is a significant change from BCPM's predecessor models, which used ARMIS ratios for plant specific expenses.[230] BCPM permits users to vary expense estimates for small, medium, and large companies, although the default values for BCPM do not vary with company size. In general, Hatfield estimates most expenses based on ARMIS data, expressed as ratios of investment.[231] Panelists in our January 1997 workshop contended that some expenses vary with investment and some vary with line counts.[232]

156. Input Values. BCPM estimates total expenses, as detailed above, at $11.34 per line per month. Hatfield's estimates of total expenses vary based on investment or other costs.

(2) Issues for Comment

157. Platform Design. We seek comment on how to establish forward-looking expenses for the selected mechanism. We seek comment on which expenses should be calculated on a per-line basis, as BCPM does, and which should be calculated as a ratio of investment, as Hatfield does. We tentatively conclude that the selected mechanism should provide the user with the capability to calculate each category of expense based on either line count or other investment, at the user's election, and request comment on this tentative conclusion. We also seek comment on whether we should forecast expenses and, if so, what forecasting technique we should use. We tentatively conclude that users should be able to use different expense estimates for small, medium, and large companies, as the BCPM allows. We seek comment on this tentative conclusion. Parties should identify and discuss in detail the differences between expenses that vary with investment and those that vary with line counts, as indicated below. Parties should also provide econometric or other studies supporting their positions. We also seek comment on whether there are measures, other than lines and investment to which specific expenses should be tied.

158. Input Values. We seek comment on the accuracy of BCPM's default input value of $11.34 per line, and urge the proponents of BCPM to submit the survey upon which they base their expense inputs. We seek comment on how this value should vary for small, medium, and large companies. We seek comment on whether the selected mechanism should use ARMIS data, data from a survey of ILECs,[233] or data from some other source. Parties should substantiate their suggestions with cost information supporting their input proposals.

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[229] BCPM Jan. 31 submission, att. 10 at 155-157.

[230] Sprint Jul. 15 *ex parte*, att. at 18-19.

[231] Hatfield Feb. 28 submission at 54-60.

[232] Proxy Model Workshop, Jan. 14, 1997, the second panel.

[233] *See supra* section III.B.2.e. and C.7.a.(1).

b. Plant Specific Expenses

(1) Background

159. Plant specific expenses include such expenses as maintenance of facilities and equipment expenses.

160. Platform Design. BCPM estimates the following plant specific expenses on a per-line basis: network support (USOA Account 6110); general support (6120); Central Office Equipment (COE) switching (6210); operator systems (6220); COE transmission (6230); information origination/termination (6310); and cable and wire facilities (6410).[234] Hatfield estimates central office switching expenses as a percentage of investment in digital switching equipment, and circuit equipment expense as a percentage of investment for all circuit equipment based on a New England Incremental Cost Study rather than an ARMIS ratio of expenses to investment.[235] Hatfield estimates NID expense as a yearly per-line expense. Hatfield uses separate expense ratios for aerial, buried, and underground cable, while BCPM uses a per-line estimate for cable maintenance that does not vary with the plant mix. Because the two models differ in their listing of plant specific expenses, the two resulting expense estimates may not be comparable. Neither model allows plant specific expenses to vary with climate or soil type. The state Joint Board members do not consider either model's approach to plant specific operating costs to be forward-looking because both are based on historical operating cost information.[236]

161. Input Values. BCPM's default per-line per-month values for plant specific expenses are: network support -- $0.15; general support -- $1.20; COE switching -- $0.34; operator systems -- $0.01; COE transmission -- $0.23; information origination/termination -- $0.07; and cable and wire facilities -- $2.76.[237] Hatfield's default central office switching expense factor is 2.69 percent of digital switching investment.[238] Hatfield's default circuit equipment expense factor is 0.015 percent of circuit equipment investment.[239] Hatfield's default for NID expenses is $1.00 per line per year. The state Joint Board members recommend that plant specific operating costs be calculated as a percentage of investment, and suggest the

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[234] BCPM app. B at 18.

[235] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997 draft at 75.

[236] State High Cost Report at 21.

[237] BCPM app. B at 18.

[238] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 75.

[239] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 75.

following percentages: 3.5 percent for cable and wire; 2.8 percent for central office switching; and 2 percent for transmission. The state members also recommend the use of nationwide factors that do not vary by company.[240]

(2) Issues for Comment

162. Platform Design and Input Values. We seek comment identifying and discussing the complete set of forward-looking plant-specific expenses for which universal service support should be available, and discussing whether each of these expenses is best estimated on a per-line basis or by some other method.[241] We seek comment on whether the platforms of BCPM and Hatfield are comparable with respect to their expense assumptions, whether one of the two generates superior expense calculations, or whether expense assumptions of the two should be combined, either in one of the two existing models or in a hybrid model, to estimate expenses most accurately. We seek comment on what specific input values for each of these expenses should be. In addition, we seek comment on whether maintenance expense estimates should depend upon plant mix and, in particular, whether an increase in the use of aerial cable also increases maintenance expenses. We also seek comment on whether plant specific expenses should vary with such characteristics as climate or soil type.

c. Plant Non-Specific Expenses

(1) Background

163. Platform Design. Plant non-specific expenses include such expenses as engineering, network operations, and power expenses. BCPM estimates the following plant non-specific expenses on a per-line basis: other property plant (USOA Account 6510); network operations (6530); and access (6540).[242] Hatfield calculates network operations expense as a percentage of ARMIS-reported network operations expense.

164. Input Values. BCPM's default per-line per-month plant non-specific expenses are: other property plant -- $0.03; network operations -- $1.33; and access $0.00.[243] Hatfield's default value for network operations expense is 50 percent of ARMIS-reported network operations expense. Hatfield contends that this percentage is reasonable because forward-looking network operations expenses are significantly lower than ARMIS-reported expenses for

[240] State High Cost Report at 21.

[241] We observe that the workshop panelists contend that some expenses vary with investment and some vary with line counts. Proxy Model Workshop, Jan. 14, 1997, second panel.

[242] BCPM app. B at 18.

[243] BCPM app. B at 18.

network operations. Hatfield asserts that ARMIS-reported expenses reflect excessive staffing at end offices.[244]

(2) Issues for Comment

165. Platform Design and Input Values. We seek comment on the complete set of forward-looking plant non-specific expenses that should be covered by universal service support, and whether we should estimate each of these expenses on a per-line basis or by some other method.[245] We also seek comment discussing what specific input values for each of these expenses should be. Parties should substantiate their suggestions with engineering and cost data regarding the forward-looking cost of the plant non-specific expenses that the mechanism should calculate.

d. Customer Services

(1) Background

166. Platform Design. Customer services expenses include marketing, billing, and directory listing expenses. BCPM estimates the following customer services expenses on a per-line basis: marketing (USOA Account 6610) and services (6620).[246] Hatfield estimates the cost of bill generation and billing inquiries for end users as a fixed, per-line expense. Hatfield includes a per-line directory listing expense and assigns local number portability expenses on a per-line basis.[247] Hatfield also assigns carrier-to-carrier customer service expenses (associated with the provision of unbundled network elements) on a per-line basis.[248] Hatfield excludes marketing (USOA Account 6610) entirely.

167. Input Values. BCPM's per-line per-month default values for customer services expenses are: marketing -- $0.35 and services -- $2.42.[249] State Joint Board members suggest that BCPM's services expenses should be reduced 29 percent to $1.75 to exclude operator services and directory assistance. They also recommend excluding marketing expenses from the

[244] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 74.

[245] We observe that the workshop panelists contend that some expenses vary with investment and some vary with line counts. Proxy Model Workshop, Jan. 14, 1997, second panel.

[246] BCPM app. B at 18.

[247] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 75.

[248] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 75.

[249] BCPM app. B at 18.

cost of supported services.[250] Hatfield's default per-line customer service expenses, which are based on ARMIS data, are: billing -- $1.22 per month;[251] directory listing -- $0.15 per month;[252] local number portability -- $0.25 per month;[253] and carrier-carrier customer service -- $1.69 per month.[254]

(2) Issues for Comment

168. Platform Design and Input Values. We seek comment identifying and discussing the complete set of forward-looking customer service expenses that should be covered by universal service support, and whether each of these expenses is best estimated on a per-line basis or by some other method. As noted above, the workshop panelists contended that some expenses vary with investment and some vary with line counts.[255] We also seek comment on specific input values for each of these expenses.

e. Corporate Operations

(1) Background

169. Platform Design. Corporate operations expenses include general, administrative, human resources, legal, and accounting expenses. BCPM estimates the following corporate operations expenses on a per-line basis: executive and planning (USOA Account 6710); general and administrative (6720); and uncollectibles (6790).[256] Hatfield estimates corporate overhead expense as a percentage of total capital costs and operations expenses.[257]

170. Input Values. BCPM's per-line per-month default input values for corporate operations expenses are: executive and planning --$0.14; general and administrative --$2.15;

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[250] State High Cost Report at 20.

[251] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 73-4.

[252] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 74.

[253] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997 draft at 75.

[254] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997 draft, at 75-6.

[255] Proxy Model Workshop, Jan. 14, 1997, second panel.

[256] BCPM app. B at 18.

[257] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997, draft at 73.

and uncollectibles --$0.17.[258] Hatfield's default corporate overhead expense is 10.4 percent of the total of capital costs and operations expenses.[259] In light of the current model inputs and section 254(k), the State Joint Board members recommend fixing corporate operations expense at 10 percent of the nationwide average of all other costs, or $2.29 per line per month, whichever is lower.[260]

(2) Issues for Comment

171. Platform Design and Input Values. We seek comment identifying and discussing the complete set of forward-looking corporate operations expenses that should receive universal service support, and whether each of these expenses is best estimated on a per-line basis or by some other method.[261] We seek comment on what the specific input values for each of these expenses should be.

f. Dates for Comments on Expenses

172. As discussed in section III.B.2, interested parties may file comments on the issues relating to expenses on or before October 17, 1997, and reply comments on or before October 27, 1997.[262]

8. Other

173. We also seek comment on any other issues related to the platform and inputs to the forward-looking cost models that are currently under consideration. Any such comments should be supported by specific data and analysis of the models. We also seek comment on whether we should develop a method to adjust the costs estimated by our cost mechanism on an annual basis, and if so how we should do so. We seek comment on whether the adjustment mechanism should be tied to inflation and include an offset similar to our price cap mechanisms. Alternatively, we seek comment on whether we should use the actual cost estimates provided by the selected mechanism for a fixed number of years, and re-evaluate and modify the mechanism at the end of that period. As discussed in section III.B.2, interested parties may file comments

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[258] BCPM app. B at 18.

[259] Hatfield Model Release 3.1 Inputs Portfolio, Apr. 3, 1997 draft at 73.

[260] State High Cost Report at 22. The state Joint Board members observed that section 254(k) "cautions against attributing an excess of common costs, such as corporate overheads, to universal service." *Id.*

[261] We observe that the workshop panelists contend that some expenses vary with investment and some vary with line counts. Proxy Model Workshop, Jan. 14, 1997, second panel.

[262] *See infra* app. A, Comment Submission Schedule.

on these issues on or before October 17, 1997, and reply comments on or before October 27, 1997.[263]

D. Support Areas

1. Background

174. Platform Design. A support area is the geographic area used to determine universal service support levels. The support area need not be the same as the geographic area used by the selected mechanism to calculate the cost of providing the supported services. The support area may be an aggregation of those geographic areas used to determine cost. For example, Hatfield 3.1 uses CBGs to determine cost and density zones, which are an aggregation of CBGs with similar line densities, to calculate support. In the Order, we concluded that support areas should be no larger than wire centers.[264] While we agreed with the Joint Board that the use of smaller support areas would allow for better targeting of support and minimize the possibility of "cream-skimming,"[265] we were uncertain that any mechanism we adopt could accurately predict the number of customers in such small areas.[266]

175. To determine the level of support a particular carrier should receive, the Commission must know the number of lines in the support area. Carriers currently do not associate lines with a particular CBG, CB, or grid cell. They do, however, keep records of the number of lines served by each wire center.[267] SBC and Sprint suggest that the use of areas smaller than the CBG will require finding the longitude and latitude (i.e., "geo-coding") of households to match lines to CBs or grid cells.[268] Commenters also assert that the models do not reflect true line counts within a CBG or for a particular wire center.[269] GTE notes that the models use the number of households in each CBG to determine residence line counts. It argues

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[263] *See infra* app. A, Comment Submission Schedule.

[264] Order at para. 250, criterion 10.

[265] Most high cost areas include some towns and other areas of more concentrated population that are less costly to serve, which may include some high-volume users, particularly businesses, that tend to generate higher revenues. The remaining customers in the area tend to be higher-cost customers with lower call volumes that generate less revenue. "Cream-skimming" refers to the practice of targeting the relatively low-cost, high-revenue customers in high cost areas.

[266] Order at para. 193.

[267] *See* SBC comments at 22.

[268] *See* SBC comments at 32; Sprint model comments at 13.

[269] *See, e.g.,* Ameritech model comments at 19.

that this approach ignores differing penetration levels among CBGs.[270] SBC states that when it compared the line counts for its operations in Texas to the counts predicted by the models, it found a difference of more than 10 percent for almost one-half of its approximately 500 wire centers in Texas.[271] GTE and Sprint note that the ILECs have line counts for each wire center, and Sprint urges the Commission to obtain those data through an information request to the ILECs.[272] State Joint Board members recommend aggregating support calculations on a wire center basis due to extensive resource sharing among CBGs.[273]

2. Issues for Comment and Comment Dates

176. Platform Design. We seek comment on whether the Commission should provide support according to geographic areas other than the geographic areas used to calculate cost. If parties suggest that we use an area smaller than a wire center, such as a CBG, they should discuss the ability of carriers to associate lines with such an area. We tentatively conclude that the ability of carriers to associate lines with CBGs, or other small areas will determine how we define support areas in the future. We seek comment on the feasibility of geo-coding households, as proposed by SBC and Sprint. Specifically we seek comment on the availability of commercial databases and software to geo-code households, and on the cost, availability, and accuracy of such databases and software. Commenters should specifically address the ability of these products to geo-code households and businesses in rural areas. We note that the California PUC has adopted a state universal service mechanism based on BCPM and uses CBGs to determine support levels.[274] We seek comment on how carriers operating under the California state universal service program have associated customers with CBGs. As discussed in section III.B.2, interested parties may file comments on these issues on or before October 17, 1997, and reply comments on or before October 27, 1997.[275]

IV. SUPPORT FOR LOCAL USAGE

A. Background

[270] GTE model comments at 45.

[271] SBC model comments at 20.

[272] GTE model comments at 46; Sprint model comments at 13.

[273] State Members' High Cost Report at 24.

[274] California PUC, Rulemaking on the Commission's Own Motion into Universal Service and to Comply with the Mandates of Assembly Bill 3643, D. 96-10-066 (Oct. 25, 1996).

[275] *See infra* app. A, Comment Submission Schedule.

177. The Joint Board recommended that support for voice-grade access to the public switched network should include a local usage component.[276] In the Order, we agreed with the Joint Board that the Commission should determine the measure of local usage to be supported by federal universal service mechanisms.[277] We concluded that "consumers might not receive the benefits of universal service support unless we determine a minimum amount of local usage that must be included within the supported services" because carriers receiving universal service support might charge high per-minute rates that prevent service from being affordable.[278] We also observed that, unless the definition of universal service includes a usage component, carriers using technologies (such as wireless) that can provide basic access relatively inexpensively but that entail higher usage-based costs would have an artificial advantage over carriers using technologies that have higher basic access costs and lower usage-based costs.[279]

B. Tentative Conclusions and Request for Further Comment

178. We tentatively conclude that a local usage component should be included in the definition of universal service to ensure that customers realize the benefits of universal service support even if they cannot afford high per-minute charges. Failing to include a local usage component in the definition of universal service would create a bias in favor of carriers (such as wireless carriers) that provide service with facilities that allow relatively inexpensive access to the network but that have higher usage costs. This bias would be exacerbated if we later set support levels using competitive bidding. Carriers able to provide relatively inexpensive access could underbid competitors, yet customers might not receive affordable service because of high usage-based charges.

179. We seek comment on the level of local usage that should be included. We could prescribe this level to be the number of minutes per month used by the average customer subscribing to flat-rate local service. Alternatively, we could define the level as the product of the average number of calls that are included in carriers' measured-rate service and the average call length.[280] We seek comment on other potential ways to calculate the local usage

[276] Recommended Decision, 12 FCC Rcd at 113.

[277] Order at para. 65.

[278] Order at para. 67.

[279] Order at para. 69.

[280] For example, Bell Atlantic offers measured-rate service in the District of Columbia that includes 60 free calls.

component.[281] We also seek comment on whether we should consider the impact of increased Internet usage on average call length and, if so, how. Finally, we request comment on whether the local usage component should differ for residential and business service. Commenters submitting usage data are requested to segregate those data between residential and business users.

180. We also seek comment on the connection, if any, between the amount of usage that the models assume to determine specifications such as switch size and average cost per minute, and the amount of usage that should be supported as part of the definition of universal service.[282] We tentatively conclude that no necessary connection exists between these two measures of usage because they serve different purposes within the support mechanisms. For example, Hatfield 3.1 currently determines per-minute switched cost based on all usage (local and toll), but determines support based only on local usage. Similarly, we tentatively conclude that the forward-looking economic cost methodology that we employ should consider all local usage to determine switching capacity and to compute average cost per minute, and that we should determine the amount of local service to include in the definition of universal service without regard to these other measures of usage.

181. Interested parties may file comments on all of the issues relating to the level of local usage on or before October 17, 1997, and reply comments on or before October 27, 1997.[283]

V. PROCEDURAL MATTERS AND ORDERING CLAUSE

A. Ex Parte Presentations

182. This is a non-restricted notice-and-comment rulemaking proceeding. Ex parte presentations are permitted, except during the Sunshine Agenda period, provided that they are disclosed as provided in the Commission's rules. See generally 47 C.F.R. §§ 1.1202, 1.1203, 1.1206.

B. Initial Regulatory Flexibility Act Certification

[281] For example, Bell Atlantic assumed 500 minutes of local usage per month in their proposed method of determining support levels without the use of a cost model. Letter from Gerald Asch, Bell Atlantic, to William F. Caton, FCC, dated Mar. 26, 1997, at att. (Bell Atlantic Mar. 26 *ex parte*).

[282] *See* Order at para. 68.

[283] *See infra* app. A, Comment Submission Schedule.

183. Section 603 of the Regulatory Flexibility Act (RFA)[284] requires an Initial Regulatory Flexibility Analysis (IRFA) in notice and comment rulemaking proceedings, unless we certify that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."[285] It further requires that the IRFA describe the impact of the proposed rule on small entities. The RFA generally defines "small entity" as having the same meaning as the term "small business concern" under the Small Business Act, 15 U.S.C. § 632.[286] The Small Business Administration (SBA) defines a "small business concern" as one that "(1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) meets any additional criteria established by the SBA.[287] Section 121.201 of the Small Business Administration regulations defines a small telecommunications entity in SIC code 4813 (Telephone Companies Except Radio Telephone) as any entity with 1,500 or fewer employees at the holding company level.[288] We have determined that the RFA is inapplicable to this FNPRM because the non-rural LECs affected by the proceeding do not meet these criteria.

184. The Commission has not adopted a definition of a "small LEC." Out of an abundance of caution, however, the Commission did include rural LECs in the regulatory flexibility analysis accompanying the Order as if rural LECs fell within the definition of "small entity" for regulatory flexibility purposes.[289] We note that the term "rural" LEC, which is statutorily defined, is based on the population density of and number of access lines in the area served.[290] For purposes of this certification, however, we need not make a conclusive finding on whether the rural LECs are small entities for purposes of the RFA, for even if rural LECs were "small entities" under the RFA, we would still certify that no regulatory flexibility analysis is necessary because none of the proposals in the FNPRM, if adopted, would affect rural LECs.

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[284] *See* 5 U.S.C. § 601 *et seq.* The RFA was amended by the "Small Business Regulatory Enforcement Fairness Act of 1996" (SBREFA), Title II of the Contract with America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA).

[285] 5 U.S.C. § 605(b).

[286] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of small business applies "unless an agency after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definitions in the Federal Register."

[287] 15 U.S.C. § 632.

[288] 13 C.F.R. § 121.201.

[289] Order at paras. 885, 892, 944-50. *See also* 13 C.F.R. § 121.902(b)(4).

[290] We define "rural" as those carriers that meet the statutory definition of a "rural telephone company" set forth at 47 U.S.C. § 153(37).

This FNPRM seeks comment only on the mechanisms the Commission should use to estimate the forward-looking economic costs that non-rural LECs would incur to provide universal service in rural, high cost and insular areas. In this FNPRM, we do not consider or adopt a forward-looking economic cost mechanism for rural LECs. As discussed in the Final Regulatory Flexibility Analysis in the Order, the Commission has permitted rural carriers to shift to a forward-looking economic cost mechanism more gradually than larger carriers.[291]

185. We therefore certify, pursuant to section 605(b) of the RFA, that these proposals would not have significant economic impact on a substantial number of small entities.[292] The Commission will send a copy of this Certification, along with this FNPRM, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. § 801(a)(1)(A), and to the Chief Counsel for Advocacy of Small Business Administration, 5 U.S.C. § 605(b). A copy of this initial certification will also be published in the Federal Register.

C. Deadlines and Instructions for Filing Comments

186. Pursuant to applicable procedures set forth in sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. sections 1.415 and 1.419, interested parties may file comments concerning the platform designs of the switching, interoffice trunking, signaling, and local tandem components must be submitted on or before August 8, 1997, and parties should submit corresponding reply comments on or before August 18, 1997. Comments concerning the platform design features determining customer location, including the geographic unit for cost calculations and the algorithm measuring customer distribution and line counts, on or before September 2, 1997, and reply comments regarding these components should be submitted on or before September 10, 1997. Comments discussing the platform-design issues relating to outside plant investment, including the algorithms determining plant mix, installation and cable costs, drop lengths, structure sharing, the fiber-copper cross-over point, digital loop carriers, and the wireless threshold must be submitted on or before September 24, 1997, with reply comments submitted on or before October 3, 1997. Comments discussing all platform issues not otherwise addressed, including the components addressing general support facilities, expenses, and support areas, and all input values issues must be submitted by October 17, 1997, with reply comments due on or before October 27, 1997. Appendix A contains a chart summarizing the submission schedule for comments and reply comments.

187. We direct all interested parties to include the name of the filing party and the date of the filing on each page of their comments and reply comments. Comments and reply comments also must clearly identify the specific portion of this Further Notice of Proposed

[291] Order at paras. 885, 944-50.

[292] 47 U.S.C. § 605(b).

Rulemaking to which a particular comment or set of comments is responsive. If a portion of a party's comments does not fall under a particular topic listed in the outline of this Notice, such comments must be included in a clearly labelled section at the beginning or end of the filing. Irrespective of the length of their comments or reply comments, parties shall include a table of contents in their documents.[293]

188. Parties should send their comments or reply comments to Office of the Secretary, Federal Communications Commission, 1919 M Street, N.W., Room 222, Washington, D.C. 20554. Parties filing on paper should also send copies of their comments to the individuals listed on the attached Service List (app. B). Parties filing in paper form should also file one copy of any documents filed in this docket with the Commission's copy contractor, International Transcription Services, Inc., 1231 20th Street, N.W., Washington, D.C. 20036. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center, 1919 M Street, N.W., Room 239, Washington, D.C. 20554.

189. Commenters may also file informal comments or an exact copy of formal comments electronically via the Internet at <http://gullfoss.fcc.gov/cgi-bin/websql/cgi-bin/comment/comment.hts>. Only one copy of electronically-filed comments must be submitted. A commenter must note whether an electronic submission is an exact copy of formal comments on the subject line. A commenter also must include its full name and Postal Service mailing address its submission.

190. Parties are also asked to submit their comments and reply comments on diskette. Such diskette submissions are in addition to and not a substitute for the formal filing requirements addressed above. Parties submitting diskettes should submit them to Sheryl Todd of the Common Carrier Bureau, 2100 M Street, N.W., Room 8611, Washington, D.C. 20554. Such a submission should be on a 3.5 inch diskette formatted in an IBM compatible form using WordPerfect 5.1 for Windows or compatible software. The diskette should be submitted in "read only" mode. The diskette should be clearly labelled with the party's name, proceeding, type of pleading (comment or reply comments) and date of submission. Each diskette should contain only one party's comments in a single electronic file. The diskette should be accompanied by a cover letter.

[293] *Cf.* 47 C.F.R. § 1.49(b).

D. Ordering Clause

191. IT IS ORDERED, pursuant to Sections 1, 4(i) and (j), and 254 of the Communications Act as amended, 47 U.S.C. §§ 151, 154(i), 151(j), and 254, that the Further Notice of Proposed Rulemaking IS HEREBY ADOPTED and comments ARE REQUESTED as described above.

192. IT IS FURTHER ORDERED, pursuant to Sections 0.91 and 0.291 of the Commission's rules, 47 C.F.R. §§ 0.91, 0.291, that authority is delegated to the Common Carrier Bureau to issue orders in this proceeding directing model proponents to make certain changes in their models in order for those models to remain under consideration in this proceeding.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

APPENDIX A
COMMENT SUBMISSION SCHEDULE

Date	Filing
August 8, 1997	*Initial comments* concerning the platform design of the switching, interoffice trunking, signaling, and local tandem components.
August 18, 1997	*Reply comments* addressing the platform design of the switching, interoffice trunking, signaling, and local tandem components.
September 2, 1997	*Initial comments* addressing the design of the customer location component.
September 10, 1997	*Reply comments* concerning the design of the customer location component.
September 24, 1997	*Initial comments* discussing the design of the outside plant investment components, including the algorithms determining plant mix, installation and cable costs, drop lengths, structure sharing, the fiber-copper cross-over point, digital loop carriers, and the wireless threshold.
October 3, 1997	*Reply comments* regarding the design of the outside plant investment components, including the algorithms determining plant mix, installation and cable costs, drop lengths, structure sharing, the fiber-copper cross-over point, digital loop carriers, and the wireless threshold.
October 17, 1997	*Initial comments* discussing all platform issues not otherwise addressed, including the components addressing general support facilities, expenses, and support areas. *Initial comments* concerning hybrid models, all input values, and support for local usage.
October 27, 1997	*Reply comments* discussing all platform issues not otherwise addressed, including the components addressing general support facilities, expenses, and support areas. *Reply comments* concerning hybrid models, all input values, and support for local usage.

APPENDIX B
SERVICE LIST

The Honorable Reed E. Hundt, Chairman
Federal Communications Commission
1919 M Street, N.W., Room 814
Washington, DC 20554

The Honorable Rachelle B. Chong, Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 844
Washington, DC 20554

The Honorable Susan Ness, Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 832
Washington, DC 20554

The Honorable James H. Quello, Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, DC 20554

The Honorable Julia Johnson, State Chair, Chairman
Florida Public Service Commission
2540 Shumard Oak Blvd.
Gerald Gunter Building
Tallahassee, FL 32399-0850

The Honorable David Baker, Commissioner
Georgia Public Service Commission
244 Washington Street, S.W.
Atlanta, GA 30334-5701

The Honorable Sharon L. Nelson, Chairman
Washington Utilities and Transportation Commission
1300 South Evergreen Park Dr. S.W.
P.O. Box 47250
Olympia, WA 98504-7250

The Honorable Laska Schoenfelder, Commissioner
South Dakota Public Utilities Commission
State Capitol, 500 East Capitol Street
Pierre, SD 57501-5070

Martha S. Hogerty
Missouri Office of Public Council
301 West High Street, Suite 250
P.O. Box 7800
Jefferson City, MO 65102

Tom Boasberg
Federal Communications Commission
Office of the Chairman
1919 M Street, N.W., Room 814
Washington, DC 20554

Charles Bolle
South Dakota Public Utilities Commission
State Capitol, 500 East Capitol Street
Pierre, SD 57501-5070

Deonne Bruning
Nebraska Public Service Commission
300 The Atrium, 1200 N Street,
P.O. Box 94927
Lincoln, NE 68509-4927

James Casserly
Federal Communications Commission
Commissioner Ness's Office
1919 M Street, N.W., Room 832
Washington, DC 20554

Rowland Curry
Texas Public Utility Commission
1701 North Congress Avenue
P.O. Box 13326
Austin, TX 78701

Bridget Duff, State Staff Chair
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0866

Kathleen Franco
Federal Communications Commission
Commissioner Chong's Office
1919 M Street, N.W., Room 844
Washington, DC 20554

Paul Gallant
Commissioner Quello's Office
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, DC 20554

Emily Hoffnar, Federal Staff Chair
Federal Communications Commission
Accounting and Audits Division
Universal Service Branch
2100 M Street, N.W., Room 8617
Washington, DC 20554

Lori Kenyon
Alaska Public Utilities Commission
1016 West Sixth Avenue, Suite 400
Anchorage, AK 99501

Debra M. Kriete
Pennsylvania Public Utilities Commission
North Office Building, Room 110
Commonwealth and North Avenues
P.O. Box 3265
Harrisburg, PA 17105-3265

Sandra Makeeff
Iowa Utilities Board
Lucas State Office Building
Des Moines, IA 50319

Philip F. McClelland
Pennsylvania Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120

Thor Nelson
Colorado Office of Consumer Counsel
1580 Logan Street, Suite 610
Denver, CO 80203

Barry Payne
Indiana Office of the Consumer Counsel
100 North Senate Avenue, Room N501
Indianapolis, IN 46204-2208

Timothy Peterson, Deputy Division Chief
Federal Communications Commission
Accounting and Audits Division
2100 M Street, N.W., Room 8613
Washington, DC 20554

James B. Ramsay
National Association of Regulatory Utility Commissioners
1100 Pennsylvania Ave., N.W.
P.O. Box 684
Washington, D.C. 20044-0684

Brian Roberts
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Kevin Schwenzfeier
NYS Dept of Public Service
3 Empire State Plaza
Albany, NY 12223

Tiane Sommer
Georgia Public Service Commission
244 Washington Street, S.W.
Atlanta, GA 30334-5701

Sheryl Todd (plus 8 copies)
Federal Communications Commission
Accounting and Audits Division
Universal Service Branch
2100 M Street, N.W., Room 8611
Washington, DC 20554