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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

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Comment Dates:

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III.C.1 platform - September 2, 1997
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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-

[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.

looking 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 economic cost of providing supported services in states

[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.

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

[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.

service support programs.

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

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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.

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 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.

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[25] Order at para. 224.

[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.

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 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

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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.

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]

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

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[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 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.

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 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,

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(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.

[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.

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, 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

[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.

[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.

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, 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

[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.

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]

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

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

[59] Hatfield Feb. 28 submission at 4.

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

[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.

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 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

[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.

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.

[64] Order at para. 245.

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

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.

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

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[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).

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

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 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

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

[69] *See* 47 C.F.R. § 0.459.

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 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]

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

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

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

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 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

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

[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.

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 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

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

[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.

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 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

[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.

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

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 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

[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.

[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.

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 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

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[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.

[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.

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 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

[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.

[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.