Apr. 24. 1997 7:36AM

No. 7392 P. 19/41
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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**
	)	

2nd Models

MAJORITY STATE MEMBERS' SECOND REPORT ON THE USE OF COST PROXY MODELS

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April 21, 1997

STATE MEMBERS' SECOND REPORT ON THE USE OF COST PROXY MODELS

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STATE MEMBERS' SECOND REPORT ON THE USE OF COST PROXY MODELS

I. INTRODUCTION AND SUMMARY

In its Recommended Decision in CC Docket No. 96-45 (Recommended Decision), the Federal-State Joint Board on Universal Service (Joint Board) expressed the belief that a properly crafted proxy model could be used to calculate the forward-looking economic costs for specific geographic areas to determine the level of support a carrier may need to serve a high cost area. The Recommended Decision indicated that the State members of the Joint Board should submit a report on the outcome of these efforts and on any state recommendations with sufficient time for the FCC to review the report prior to the issuance of an Order implementing the Recommended Decision.

On March 26, 1997, the State members of the Federal-State Joint Board on Universal Service submitted the State Members' Report on the Use of Cost Proxy Models (First Report).1 In that First Report, the State members expressed their continued concerns about the adequacy and accuracy of the cost proxy models as developed thus far and recommended that the FCC select one model as soon as possible to focus efforts toward resolution of the concerns. We also presented our preliminary recommendations on several issues related to cost proxy models, and we provided our State staff's preliminary analysis on items such as the model input variables and the level of support. We indicated in the First Report that we would provide a subsequent recommendation on the unresolved issues, including a recommendation on the selection of a single proxy model, in the near future.

This Second Report contains the recommendations on many of the outstanding issues and represents the completion of the immediate task that was assigned to the State members through the Recommended Decision. We stand ready to continue State participation in the examination and resolution of universal service issues as this proceeding continues.

The State members recommend that the FCC select the Benchmark Cost Proxy Model (BCPM), sponsored by Sprint, US West, and Pacific Bell for further analysis and refinement, with the objective to be the BCPM's use in determining the amount of support to be received by local exchange carriers for serving high cost areas. We further recommend that the control and administration of the BCPM should be transferred to the FCC as soon as possible to ensure independence of the analysis and application. In this report we discuss the eight criteria for evaluating the proxy cost models for universal service, and the extent to which the BCPM and Hatfield models fulfill the criteria.

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1 State Members of the Federal-State Joint Board on Universal Service, State Members' Report on the Use of Cost Proxy Models, CC Docket No. 96-45, March 26, 1997 (First Report).

Criterion seven is the most problematic for both models. Both models have undergone extensive revision during the past several months, and the parties in this proceeding have not been able to fully analyze the models.

This report presents the reasoning for the selection of the BCPM for further refinement, and describes the conditions to which the State members believe the BCPM should be subjected before accepting the model for use. As tentatively described in the First Report, the State members offer recommendations on major inputs, including cost of capital and depreciation.

Further, this report describes the State members' perspective that a cost-based benchmark should be used in determining the level of support.

II. EVALUATION OF THE COST PROXY MODELS

A. Criteria

In its Recommended Decision, the Joint Board recommended a set of criteria for evaluating proxy cost models for universal service.2 These criteria will serve as a basis for our evaluation of the models. Comparing the models' fulfillment of the criteria reveals both the differences between the models as well as the similarities. Furthermore, the criteria provide a benchmark for how the models have progressed. Unfortunately, the models have still not met the requirements of criterion7, which pertains to the openness, verifiability and plausibility of the models. We believe that the selection of a single model will be beneficial because industry resources will focus on improving the single model.

> *(1) Technology assumed in the model should be the least-cost, most efficient and reasonable technology for providing the supported services that is currently available for purchase, with the understanding that the models will use the incumbent LECs' wire centers as the center of the loop network for the reasonably foreseeable future.*

Both the BCPM and Hatfield models assume essentially the same technology with the exception of long loops. Both models assume digital switching, a mix of copper and fiber feeder plant, the use of integrated digital loop carrier (DLC) technology and copper distribution plant. The models diverge in their respective approaches to long loop design, and this divergence constitutes a significant difference in the models. Although the two models treat fiber in the feeder similarly, this design may require more costly fiber-based technology than is necessary to provide supported services under the proposed definition of universal service. The design should only be

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2 Recommended Decision at 277.

incorporated if it is the least cost technology. Additional details of the models' network architectures are discussed in Section II-C, below.

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

Both models account for all supported network features or functions including the loop, switching, transport, and signaling. One area in which the models differ significantly is in the treatment of transport and signaling. The Hatfield 3.1 employs a model of transport and signaling that is significantly more detailed than that of the BCPM. The Hatfield 3.1 models the interoffice transmission facilities necessary to connect end offices and tandem switches. The model incorporates fiber ring technologies carrying signals in a Synchronous Optical Network (SONET) format.3 The BCPM merely applies a fixed factor to switch investment to estimate interoffice investment.4 The BCPM sponsors feel that this treatment does not materially impact the results of the model.

While in general, signaling and transport do not account for a large share of the overall cost of providing supported services, these costs may be significant for specific locations. For example, according to the Hatfield 3.1 model, transport costs $0.10 per line per month for Southwestern Bell Texas as a whole, yet there are 17 wire centers where per-line per-month transport costs exceed $25.00 5 If the phenomenon of extremely high transport costs exhibited by the Hatfield model is accurate, then the BCPM treatment of adding a percentage on to the switch may not be adequate, especially when applied to small companies.

(3) *Only forward-looking costs should be included. The costs should not be the embedded cost of the facilities, functions or elements.*

Both models are structured to estimate forward-looking costs. Other than the location of the central office, neither model makes reference to the embedded plant used to provide service. With the proper inputs, both models generate forward-looking costs to estimate the number of lines and quantity of facilities necessary to provide supported services (assuming that the structure of the models is corrected as recommended herein). These inputs include the current purchase price for equipment and materials, the prevailing cost of installing plant, proper depreciation and cost of capital and operating expenses that correspond to the network being modeled. The purchase price and prevailing costs for installing plant differ between the models, but appropriate inputs can be determined by verifying these costs. While these costs are

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3 AT&T & MCI Hatfield Model Release 3.1 Model Description February 28, 1997, p. 17.

4 US West Ex Parte Letter Benchmark Cost Proxy Model Presentation CC Docket 96-45, January 31, 1997, Benchmark Cost Proxy Model Methodology, p. 131.

5 AT&T & MCI Ex Parte CC Docket: 96-45 - Federal-State Joint Board on Universal Service. Letter to Brian Roberts. February 19, 1997, Attachment: Hatfield Model Release 3 - Expense Module. Wire Center Level Calculations.

sometimes difficult to obtain due to their proprietary nature, a method can be developed to verify these costs. Our First Report included recommendations for proper depreciation and cost of capital expenses. Operating expenses are probably the most difficult element of costs to model on a forward-looking basis. Both models rely on historical experience to estimate forward-looking costs.

(4) *The model should measure the long-run costs of providing service by including a forward-looking cost of capital and the recovery of capital through economic depreciation expenses. The long run period used should be a period long enough that all costs are treated as variable and avoidable.*

Both model sponsors assert that the default cost of capital and depreciation rates are forward-looking and economic. Since depreciation and cost of capital rates are sufficiently disaggregated, the choice of the appropriate rates is independent of the model chosen. The First Report recommends specific estimates of forward-looking economic cost of capital and depreciation rates.

(5) *The model should estimate the cost of providing service for all businesses and households within a geographic region. This includes the provision of multi-line business services. Such inclusion allows the models to reflect the economies of scale associated with the provision of these services.*

Both models attempt to include demand for all businesses and households. Estimating demand for business lines and second residential lines remains problematic, since the models must rely on indirect sources to estimate these line counts. Estimates of business and second residential lines suffer from many of the line count problems identified elsewhere in this paper. It is unclear whether some of the new commercial databases the models have used to identify households and residential line counts represent an improvement over census data. It is also unclear why, if both models attempt to true up line counts to the same publicly available sources by study area, they arrive at different line counts. One difference between the models is that the Hatfield model attempts to include special access lines, while the BCPM does not. For the purposes of estimating universal service costs it may be appropriate to consider special access and private lines to the extent they may share certain costs, such as structure costs, with supported services.

(6) *A reasonable allocation of joint and common costs should be assigned to the cost of supported services. This allocation will ensure that the forward-looking costs of providing the supported services do not include an unreasonable share of the joint and common costs incurred in the provision of both supported and non-supported services, e.g., multi-line business and toll services.*

Both models include joint and common costs although they do not employ this label. By including all relevant capital costs and operating expenses the models capture joint and common costs. However, neither model completely satisfies the requirement to only allocate a reasonable share of joint and common costs to supported services. For example, the models do not allocate the costs of "building" local loops that can be employed to provide various services, including supported services. The models do accept an allocation of common operating expenses, such as corporate overheads and retail costs. For joint retail costs both models accept a per line estimate for these costs from another source. The models' allocation of more than a reasonable share of joint and common costs to supported services requires that care be taken when developing the benchmark against which the proxy cost model results are evaluated.

The allocation of joint and common costs will have to be addressed in a more thorough manner before applying these models to rural telephone companies.

(7) *The 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.*

Both the BCPM and Hatfield models have failed several facets of criterion seven. Parties have not had sufficient time to thoroughly review the models. Critical input data have not been verified, and outputs have not been demonstrated to be plausible.

Several parties which commented on the FCC staff's public notice on computer models complained that they did not have sufficient time to review the models.6 Both models have undergone substantial revisions, and critiques of superseded versions have not been helpful for addressing the current models. In many respects, these changes were essential to respond to the specific criticisms raised by the Joint Board, the FCC staff, or other parties; however, they have meant that previous analysis does not necessarily apply to the current versions of the models. As a result of the compressed schedule, parties continue to provide critiques addressing basic structure, assumptions, and functioning of the models to which the model sponsors have not had an opportunity to respond, and which the state staff has not had an opportunity to investigate thoroughly.7

Sponsors have made only limited progress in providing verifiable inputs. Many of the BCPM's inputs, for example, are based largely on a survey of large ILECs. Neither the survey instrument nor the data compiled have been submitted in this proceeding. Only the survey section on switching has been released, but this has raised more questions than it answers.

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6 Bell Atlantic/NYNEX Reply Comments, CPD Docket No. 97-2, p. 2. Southwestern Bell Telephone Reply Comments, CCB/CPD 97-2, pp 1-2. GTE Comments at p. 4.

7 For example, on April 4, 1997 US West and Sprint wrote a letter to the state Members of the Joint Board with a paper titled "Preliminary Review of the Hatfield Model" articulating a number of concerns regarding the Hatfield model which had not previously been raised.

While the Hatfield sponsors have submitted reports to justify the default assumptions on cost of capital and economic depreciation rates, there are many other critical inputs that are based on the expert opinion of the model developers.8 For example, the assumptions about structure sharing among utilities and competitive telecommunications carriers remain controversial.

The plausibility of outputs is also a concern. As discussed elsewhere in this report, wire center line counts indicate that the models inaccurately count and locate customers. The ability to place customers is critical, as all subsequent estimations of the model are based on this primary determination. More troubling, from a universal service perspective, is that it appears extremely difficult to accurately estimate demand in high cost, rural areas. In addition, there has not been sufficient time for parties to compare the outputs of the models to an external measure of how much it would cost on a forward looking basis to serve an area in the field in a systematic way. This type of analysis will be necessary to ensure that the models produce plausible results.

While neither model satisfies criterion seven yet, we are convinced that parties will be able to resolve the remaining modeling issues, such as verifying critical inputs and ensuring that outputs are plausible, by focusing on a single model.

(8) *The 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. The models should also allow for different costs of capital, depreciation, and expenses for different facilities, functions or elements.*

Both models have evolved to the point where they are extremely flexible: virtually all relevant inputs are user adjustable. Many of the inputs in the BCM2 which were "hard wired" are now flexible and user adjustable in the BCPM. The BCPM has more user definable inputs than the Hatfield for structure costs. The Hatfield model allows more flexibility in defining certain switching cost parameters; however, for universal service purposes, much of this flexibility is unnecessary.

It is somewhat more difficult to examine the calculations than in previous editions of the models, but the transparency of the models appears to have been sacrificed in order to increase processing speed. This trade-off is understandable, but the underlying equations must be traceable.

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8 See, for example, the source for DLC investments in AT&T and MCI, Hatfield Model Release 3.1 Inputs Portfolio, April 3, 1997, p. 48.

B. Model Recommendation

In our First Report, the State members recommended that the FCC adopt a single cost proxy model as quickly as possible in order to focus the efforts of all parties on improving that model. We now recommend that the model to be used should be the BCPM model sponsored by US West, Sprint, and Pacific Bell.

In conjunction with selecting the BCPM, we also recommend the transfer of the control and administration of the model to the FCC. This action may entail a transfer of rights to the underlying model code and legal release of the access to the model, but we believe it is necessary to ensure that future revisions to the BCPM will be independent and within the control of the FCC. We urge all participants in this proceeding to work in cooperation with the FCC and the Federal-State Joint Board to determine the appropriate revisions to the BCPM.

Our recommendation to select the BCPM, along with our suggested inputs, should not be viewed as a wholesale endorsement of all aspects of this model. Rather we believe that this model is currently the best platform from which interested parties and regulators can make collective revisions.

Both the Hatfield and BCPM models reflect significant efforts to develop an accurate cost proxy model, and we appreciate the contributions of all parties. We conclude, however, that the BCPM more closely meets the overall selection criteria. The most significant decision points for our conclusion are the manner in which the BCPM has designed its loop network, the detail in which it models terrain.

Network Architecture

Both models acknowledge that distribution cable lengths using the standard gauge of copper cable assumed in the models will be insufficient to deliver voice grade service to the longest loops. The two models address the problem differently: the BCPM introduces fiber to the distribution plant while the Hatfield 3.1 uses coarser gauge cable and loading coils to accommodate long loops. While both designs appear to ensure voice grade service, the differing treatment means that the BCPM will be able to provide a higher level of service to customers on the long loops. As a practical matter, this means that the BCPM network will be able to deliver higher modem speeds for long loops. The Recommended Decision asserted that voice grade service should be included in the definition of universal service and that this service should occur in the frequency range between 500 Hertz and 4000 Hertz for a bandwidth of approximately 3500 Hertz.9 Some parties have questioned the ability of copper loops with loading coils to achieve this level of service.10 Additionally,

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9 Recommended Decision at 48.

10 RUS Reply Comments, CC Docket 96-45, p. 3.

the Recommended Decision alluded to dial-up access to the Internet.11 Dial-up access to the Internet at acceptable modem speeds may prohibit the use of loading coils. The Rural Utility Service (RUS) notes that the use of fiber and DLC in long loops corresponds to its network design standards.12 While long loop design affects a relatively small portion of households, these are generally the high cost, rural households for which the Act mandates reasonably comparable service. The BCPM's use of fiber and DLC to serve long loops appears to be a more appropriate forward looking assumption than the Hatfield 3.1 model's reliance on loading coils.

Another difference in the models, primarily affecting long loops, is the inclusion of wireless technology. The BCPM includes an optional $10,000 cap on the per-line investment of the wire-line technology which is the basis of the model. Beyond the $10,000 threshold, wireless technology is assumed to be more efficient. The Hatfield 3.1 model does not include a similar cap for wireless technology. While the concept of including wireless technology to accommodate certain high cost areas has promise, the BCPM's implementation of this concept needs additional development. The BCPM does not specify the type of wireless technology to be used in high cost areas, identify the conditions under which wireless technology becomes an efficient alternative to wireline technology, or provide cost justification for the cap. As RUS points out, Basic Exchange Telephone Radio Service (BETRS) is one candidate for wireless technology for low density areas, but is only efficient under specific circumstances.13 The BCPM's wireless cap should not be used at this time, but further efforts should be made to determine the circumstances under which wireless technology becomes the most efficient means of supplying supported services.

While both models assume the use of optical fiber in the feeder plant when it exceeds 9,000 feet, this technology should only be incorporated in the models in cases where it is the least cost way to provide supported services. Although this may reflect an appropriate engineering judgment for providing the full array of services local exchange carriers plan to provide over their loops, it is not necessary for providing supported services. Instead, we recommend a 12,000 foot threshold. As the cost of DLC declines, the threshold will also change. It is unclear whether the technology assumed in both models represents the most efficient way to provide supported services.

Terrain and Placement Detail

In determining the cost of installing cable facilities the Hatfield model incorporates additional cost for installation based upon depth to bedrock, hardness of bedrock and surface soil texture. Where bedrock is encountered within the default threshold of 24 inches, the model uses a multiplier to represent the increased cost of burying cable in rock. The default hard rock placement multiplier is 3.5, and the soft rock placement multiplier is

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11 Recommended Decision at 69.
12 RUS Reply Comments, p. 3.
13 RUS Reply Comments, p. 2.

2.0. If bedrock does not exist the soil texture is examined to determine if the soil can be plowed. If difficult soil conditions are encountered the model uses a default multiplier of 1.2 to route distribution and feeder cable around difficult soil conditions.

The BCPM considers four terrain variables, depth of water table, depth of bedrock, hardness of bedrock, and the surface soil texture when determining the cost of installing cable facilities. Structure cost are developed for aerial, buried, and underground by density group and terrain difficulty. The cost per foot varies based upon the type of activity required for installation. Specific costs are developed for various types of activity required for installation, such as trench and backfill, boring, trenching through asphalt or concrete.

We believe the BCPM method of developing the additional cost per foot for difficult terrain is a more reasonable approach to determining the cost of facility installation. The Hatfield model's method of using a multiplier for bedrock does not appear to adequately address the various costs that will exist based upon the activity required for installation. As opposed to a cost additive, a multiplier for cost will be more likely to overstate costs in some areas and understate costs in others. Also it is not reasonable to assume, as the Hatfield model does, that an additional 20 percent of distribution cable will allow the installer to avoid the difficult soil condition.

While we believe the more detailed method used in the BCPM for calculating structure cost is superior to the method used in the Hatfield model, we do not endorse the specific cost per foot for each type of installation. The per foot cost for the different types of installation appears to have increased substantially from the BCM2 to the BCPM. The BCM2 construction costs were based upon the national average of available contractor prices. The BCPM cost for different types of trenching done in each of the density zones is based upon "forward looking" data received from a cost questionnaire.14q We recommend that the FCC and the Joint Board, as a part of the ongoing review of the models, attempt to locate additional information on the cost of installation of distribution plant.

C. Primary Issues Concerning Model Structure

Although we are recommending the use of the BCPM as the proper platform for further evaluation and refinement, we believe the specific items described in this section must be addressed before the model can be considered for use in determining support levels for universal service. These items were perceived as weaknesses in both the BCPM and Hatfield models, and we believe they represent faults in the logic or design of the model elements, as opposed to merely being input variable choices.

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14 January 30, 1997 response to the Public Notice, released December 12, 1996, filed on behalf of Pacific Bell, U S West, and Sprint, Attachment 9, p 12.

Line Counts

The establishment of reasonably accurate line counts by CBG or wire center is an essential foundation for the construction of a cost proxy model. Any significant error in the assignment of residential and business lines to the small geographic areas will reduce the importance of any further analysis of other modeling variables. The two major obstacles to accurate line assignment are the current unavailability of empirical line counts by CBG, and the incumbent LECs' designation of the number of businesses in each wire center as proprietary. As a result, the modelers have resorted to factors and other means to project the number of lines in a CBG or wire center.

The BCPM model starts with the existing central offices and boundaries throughout the country, identified with On Target's Exchange Info data product.15 This data is input into a geographic information system where each CBG is associated with its central office based upon the location of the centroid of the CBG. Each CBG is assumed to be square for purposes of the model. The number of households in each CBG is taken from the U.S. Census Bureau's 1990 data, and modified by the Census Bureau's 1995 estimate of the county's population change. The number of business lines is input from data based on Dun and Bradstreet's database of employees per CBG, and industry reports of business lines by state. Businesses are not differentiated between those that might have a higher ratio of employees to telephone lines from those that would have a lower ratio. The BCPM sponsors suggest that a survey of actual lines for both business and residential customers may be the most accurate way to estimate the number of business lines.16

The BCPM sponsors also assert that this is merely an input problem, and should not be included in a discussion of the model structure.17 However, the manner in which the census bureau data are merged with input factors to estimate the number of subscriber lines in each CBG and wire center appears to be a major model design step, and the current erroneous results are a major concern to the State members.

The Hatfield 3.1 model uses a combination of survey data, commercial databases and ARMIS information to estimate business and residential demand.18 Surveys are used to determine the demand characteristics of certain types of households or businesses. Survey results are then matched to the household or business characteristics of individual CBGs to estimate the number of residential and business lines.

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15 Description from BCPM Model filing, January 31, 1997.
16 US West, Response to Public Notice of December 12, 1996 (DA96-2091), p. 11.
17 Sprint ex parte filing with Joint Board, April 4, 1997, p. 2.
18 Hatfield Model Release 3.1, Model Description, Appendix A, A-3.

GTE has proposed an alternative method for estimating demand which would rely on actual line counts per wire center.19 The distribution of lines within the wirecenter would be determined by the CBG household and business counts from other sources.

The State members continue to have serious concerns about both models regarding the estimates of customer lines on a CBG basis. We believe that this is an issue that must be addressed further by industry and regulatory analysts before the model can be used with confidence. We believe that the model should be expected to match within 10 percent of the actual lines served in a wire center. If the model cannot produce such a result, then we believe that an external input -- such as the approach advocated by GTE -- should be used on an interim basis until a better method of estimation can be developed.

Dispersion of Loops Within a CBG

Another major concern of the State members is the modeling of the wire center in a large CBG as described in the staff's analysis in the First Report. As highlighted in comments in the proceeding,20 the mismatch between the community surrounding the wire center and the centroid of the CBG can cause significant errors in modeling the local network. This mismatch occurs whenever the centroid of a CBG is not in close proximity to the actual concentration of population density. This centroid/wire center mismatch can force the model to overestimate the lengths of the local loops and the portion of the wire center served by fiber and digital loop carrier. The inaccurate assumptions increase the cost of service for certain wire centers.

The models make contrasting assumptions about how population is dispersed within a CBG, leading to differences in loop length and corresponding costs, especially in low density areas. The Hatfield model divides the CBG into four quadrants, then assumes clustering within the quadrants; creating a "window pane" effect.21 The model uses data on unpopulated areas within a CBG and assumptions about lot size and configuration to determine how each of the panes are populated and the degree of clustering. In low density areas the BCPM reduces the stated CBG square mile areas based on the road network.22

The details of the BCPM's process for reducing the average area are not clear, since the development is external to the model. The BCPM sponsors have indicated that they are not satisfied with the road overlay system and are planning to adopt other mechanisms in subsequent versions of the model.23 We do not know whether the BCPM sponsors plan to employ Census Block or longitude and latitude grid data to implement the subsequent proposals. The state members believe that an improved method for identifying household and business

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19 GTE Reply Comments, CCB/CPD 97-2, pp. 30-31.

20 Maine PUC ex parte Comments, February 14, 1997, p2 - 12.

21 Hatfield Model Release 3.1 Model Description, pp. 29-30.

22 Ex Parte of Pacific Bell, Sprint and US West, January 31, 1997, Attachment 9, Benchmark Cost Proxy Model Methodology, p. 139.

23 Ex Parte of Pacific Bell, Sprint and US West, January 31, p. 3.

locations is essential prior to adopting the BCPM for use in distributing high cost funding. Whatever process is ultimately used for identifying clustering should be integrated into the model and should not be done independent of the model. The Hatfield model's more open structure in defining the parameters of its clustering system should be incorporated in the BCPM. Since the treatment of clustering, together with lot shape and placement also has implications for drop lengths, this too needs further consideration in the BCPM.

Parties are encouraged to devise methods to address these areas of concern within the BCPM model. We suggest that attention also be focused on the relationship between the location of a wire center, or the center of concentration of population density, and the centroid within a large CBG. We believe that the model should produce a reasonable approximation of the dispersion within wire centers. This dispersion should be compared to the dispersion of households in a sample of low density CBGs throughout the country to determine how well the dispersion assumptions in the model work, and under what circumstances they fail.

Land and Buildings

The BCPM and the Hatfield use diverse methods for calculating the cost of land and buildings supporting the switch investment.

The BCPM calculates the land investment by applying a land ratio to the switching investment. The land ratio (value of land divided by the sum of the COE accounts) is based on 1995 ARMIS data. In the same manner the building investment is calculated by applying the building factor to the switching investment. The building factor is based upon a LEC industry data request.

We have concerns with the logic of relating the investment in land and buildings to the investment in switching. The default value for switching costs varied significantly from the BCM2 to the BCPM based upon a change in source information. The increase in switch investment also increased the land and building investment proportionately. It does not seem logical that a change in switch cost, unrelated to the number of switches or switch locations, should effect the cost of the building or the land.

The Hatfield model's wire center investment to support end office and tandem switches is based on assumptions regarding the room size required to house a switch, construction costs, lot sizes, land acquisition costs and investment in power systems and distributing frames. The model computes required wire center investment separately for each switch. For wire centers housing multiple end office switches, the wire center investment adds switch rooms to house each additional switch. The Hatfield model assumes the size of the building by square foot is directly related to lines served; for example, 1,000 lines would require 1,000 square feet, 5,000 lines would require 2,000 square feet. Construction costs are assumed to increase with line count. A building for 1,000 lines costs $85 per square foot in the Hatfield model, for 5,000 lines costs $100 per square foot. Land price has the same relationship: 1,000 lines costs $7.50 per square foot, and 5,000 lines cost $10 per square foot.

We have concerns with calculating the cost of construction of the building and the cost of the land based upon the number of lines served. The square feet required for the switch building may have some relationship to the number of lines served. Over time, however, switches have become smaller while serving more lines.. We see no justification for accepting the relationship assumed by the model sponsors that it requires ten times as much building space for a 50,000 line switch as it does for a 1,000 line switch.

It is not clear why the number of lines would have a bearing on the cost per foot for construction. The model sponsors have not supported why a building constructed for a 1,000 line switch would cost $85 dollars per square foot, while a building constructed for a 50,000 line switch would cost $150 per square foot. We have the same concerns regarding the calculation of the land investment. We see no justification for accepting the assumption that the land for a 50,000 line switch will cost 266 percent more per square foot than the land for a 1,000 line switch.

Analysis of this issue must recognize that both models begin with a scorched node assumption. The models are built on the basis of the current switch locations. Since the number of switches and the switch locations are based on historical data, we suggest a revision to the model that would begin with the historical cost of land and buildings on a per switch site basis. The historical cost of land and buildings per switch could then be adjusted to reflect forward looking cost.

Plant Specific Operating Expenses

Plant specific operating expenses include the costs of repair and maintenance of specific types of plant. The BCPM has moved away from the treatment of the original BCM, where all operating expenses were related to investment, and instead adds a fixed per line expense amount for each type of plant. The BCPM estimates repair and maintenance on a per line basis based on responses to a survey of incumbent local exchange carriers. As suggested in the First Report, the approach that the model takes regarding plant specific operating expenses is an area where the econometric analysis suggested by the FCC's economic cost model paper may be helpful.24 Econometric analysis may be able to determine whether expenses vary according to the number of lines, the level of investment or some other measure. Until this analysis is available, we recommend relating plant specific operating costs to the level of investment, similar to the Hatfield Model's approach, because this seems to be the most reasonable treatment. However, the notion that added congestion and other factors present in urban areas with generally lower loop investment levels may raise the cost of repair and maintenance in these areas cannot be dismissed.

The State members recommend that the model be revised so that plant specific operating expenses will be calculated as a percentage of investment.

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24 The Use of Computer Models for Estimating Forward-Looking Economic Costs" An FCC Staff Analysis, para. 69.

III. INPUT VALUES

In the First Report, we included state staff recommendations on several input variables for the models; however, those recommendations were somewhat tentative pending the selection of the preferred cost proxy model. In Appendix A of this report, we present recommendations for many of the input variables for the BCPM. These input recommendations are based on current information. Our lack of recommendation on any input values should not be viewed as an endorsement of the default values. As we proceed in the refinement of the model and receive additional information, the states intend to continue to review and re-evaluate the current recommendations.

Due in part to the incomplete nature of the model development, we are not including reports on the revenue impact of these recommendations. However, we believe that our inputs modifications thus far will result in a fund size between $4 billion and $8 billion. As the other recommendations contained in this report are made, the amount of support calculated by the model will obviously change.

IV. ESTABLISHING A BENCHMARK

In the Recommended Decision we supported an average revenue benchmark that included revenues generated by local, discretionary, access services, and others as found appropriate.25 Using an average revenue benchmark recognizes the joint and common costs of providing discretionary and other services that are inherent in the models. Numerous commenters opposed the inclusion of discretionary and access service revenue in the benchmark.26 They argued that not all of the cost of these services are included in the models. While we still believe that the model, and specifically the loop cost in the model, supports a variety of services, we are aware of the difficulty of determining a revenue benchmark that will match the service revenue and the cost of the services included in the model. For this and the following reasons we recommend a benchmark based upon the national average proxy cost rather than national average revenues.

A cost-based benchmark will be relatively stable compared to a revenue benchmark. If competition reduces the average revenue, a revenue benchmark will decline. This could result in an increase in the universal service support by expanding the difference between the proxy cost and the revenue benchmark.

A national average revenue benchmark would require periodical review and more regulatory oversight than a cost-based benchmark. Additional administration will be incurred to gather and process the information necessary to maintain a current representative benchmark. The information will become increasingly difficult to obtain as new entrants enter the market and competition increases.

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25 Recommended Decision p. 161.

26 MCI comments p. 9, Sprint comments p. 19

Further, we agree with the comments expressed by the California Public Utilities Commission 27 and MFS Communications 28 that a benchmark based upon the nationwide average proxy cost is a more straightforward means of establishing a benchmark, it will better identify and focus support to the high cost areas.

As discussed in our First Report, the FCC may wish to consider the use of a density-based threshold that may ensure that support is targeted to rural or low density areas.

In making this recommendation, we recognize that the objective of ensuring that only a reasonable allocation of joint and common costs be assigned to the cost of supported services will not be completely satisfied. However, no practical alternative to out recommendation has been presented at this time. We recommend that the members of the Joint Board, the FCC, and their staff continue to address this issue.

V. IMPLEMENTATION ISSUES

As outlined in the First Report, we recommend a transition period before using proxy models to distribute universal service support to non-rural carriers. We recommend a three-year phase-in to allow evaluation of the proxy model's accuracy and to continue to examine other methods of determining the amount of universal service support. We believe it is important to choose a proxy model and proceed with implementing the 1996 Act. At the same time, we recognize that we should continue our efforts to determine the best method of calculating universal service support for high cost areas. We believe a three-year phase-in accomplishes both of these goals.

We recommend that the members of the Joint Board , the FCC and their staff work together to monitor the proxy models throughout the proposed transition The continuing review should include an assessment of the accuracy of the proxy models and review of other methods to calculate universal service support for high cost areas.

VI. CONCLUSION

The State members of the Federal-State Joint Board on Universal Service appreciate this opportunity to provide further input to the Commission for consideration in this proceeding. We believe that through the selection of a single cost proxy model -- the BCPM -- the formidable expertise of the many participants in this case can be focused on resolution of the outstanding issues and refinement of the model for use in the determination of universal service support.

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27 California Public Utilities Commission comments, p. 6

28 MFS Communications Comments, p. 25

Our selection of the BCPM is solely for the purpose of calculating the support for the federal universal service fund. We believe individual states are in the best position to determine the model or method of funding for universal service or determining the cost of unbundled network elements for their states.

As discussed in our First Report, we believe there are many unresolved issues remaining in our evaluation of cost proxy models, and there are many issues to be addressed in dealing with the transition from the current USF mechanism to the new program. We believe the States should play a significant role in that analysis and transition, through the Federal-State Joint Board process.

Appendix A
PROPOSED INPUT VALUES FOR THE BCPM MODEL

This appendix provides the State members' recommendation of the values that should be used as inputs for the BCPM.

1. Cost of Capital: As discussed in detail in our previous report, we recommend an overall Rate of Return (ROR) of 10.05%, based on a cost of equity of 11.75 at 60 percent of the capital structure and a cost of debt of 7.50 at 40 percent of the capital structure.

	BCPM Default	Recommended
Return on Equity	13.1%	11.75%
Debt Rate	7.8%	7.50%
Debt Ratio	32.8%	40%
Discount Rate	7.8%	11.75%
Return on Capital	11.4%	10.05%

2. Depreciation: The following changes should be made in the depreciation lives used in the BCPM model. Salvage values and cost of removal should remain at their default parameters.

Account:	BCPM Default Life (yrs)	State Recommendation Life (yrs)
Aerial Cable - Copper	12.5	18
U.G. Cable - Copper	11.5	18
Buried Cable - Copper	14	18
Switching Equipment	10	14
Circuit Equipment	8.5	10

3. Fiber/Copper Crossover:

As discussed in more detail in our first report, the input parameters for the fiber/copper crossover should be changed as follows:

	BCPM Default	Recommended
Cable Break Point	12,000 ft	15,000 ft
CprMaxDistr	12,000 ft	18,000 ft

These crossover inputs are expressed in terms of the total length of the loop, but correspond to a 12,000 foot cutoff between fiber and copper in the feeder plant.

4. Operating Expenses:

In our first report we discussed reducing service and marketing related operating expenses and associating plant specific operating expenses with investment. Reducing the service and operating expenses can be accomplished without changing the structure of the BCPM; therefore, these changes are reflected in the table shown below. However, associating plant specific operating expenses with investment cannot be accomplished without a change in the structure of the model.29 Consequently, for COE Switching, COE Transport and Cable and Wire expenses, the table below contains per line expense amounts which roughly correspond to the amount of expenses that would result if the expense factors proposed in our first report were applied to the average per line level of investment generated after the changes in plant are implemented in the BCPM. While these per-line expenses should result in similar average costs to what would occur if our suggested change in the model are implemented, the distribution of costs between high and low cost areas will not follow the average cost pattern that would occur if the suggested plans were carried out. Consequently, low cost areas will have higher costs and high cost areas will have lower costs than would occur if our recommendation is implemented.

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29 One of the sponsors of the BCPM, Sprint, also advocates this approach to some operating expenses and acknowledges that making this adjustment would require a modification to the BCPM. Sprint Ex Parte Presentation of March 25, 1997. Sprint Proposal for Using Proxy Model Results for USF, p. 5, footnote 3.

All of the operating expense inputs to the BCPM which rely on the BCPM survey, both those for which we have made specific recommendations and those not discussed, should be subject to further review as alternate data sources are examined.

	BCPM Default	Recommended
COE Switching	0.34	0.30
COE Transmission	0.23	0.25
Cable and Wire Facilities	2.76	2.35
Marketing	0.35	0.00
Services	2.42	1.75

5. **Switching Costs:**

The First Report included the staff's discussion of the extreme differential between the two models' input defaults for switching costs. Based on the very sketchy evidence submitted on switching costs, the staff indicated their belief that the costs might be in the range of $100 to $150 per line. However, because of the lack of vendors' true sales data, the State staff recommended that the FCC and their staff perform additional analyses and attempt to obtain more reliable switch vendor information to refine this model input.

In a recent ex parte filing, Sprint has suggested the following costs for central office switching, based on their experience.30 We are including these costs for our current model run; however, we continue to recommend that the FCC staff perform additional analyses to arrive at suitable inputs based on the switching cost experience of a variety of LECs.

	BCPM Default	Recommended
Fixed/Startup Cost	$261,871	$150,000
Per Line Cost	$225	$110

30 Sprint ex parte Comments, March 21, 1997

6. Digital Loop Carrier:

The costs of digital loop carrier (DLC) have been elusive as well, and the State staff chose not to offer a recommendation on DLC costs in the First Report because of the wide disparity between the costs shown in the Hatfield and the BCPM models, and also because of the lack of alternative independent evidence concerning these costs. The Maine PUC asserted that the investment values used in the BCPM are higher than the costs incurred by some small independent telephone companies.31 In the recent filing by Sprint,32 the company provided empirical data from their experience. The Sprint data appears to approximate the Maine illustrations more closely than does the BCPM.

The State members recommend, consistent with our recommendations regarding switching costs, that the FCC staff utilize additional publicly-available data to ascertain an acceptable solution to the DLC costing input. For the purpose of the calculations for this report, we will use the Sprint input recommendations as shown below:

	BCPM Default		Sprint Proposal	
DLC Fiber Size	Fixed Cost	Per Line Cost	Fixed Cost	Per Line Cost
0 - 48	$38,867.00	$92.81	$10,395.00	$250.00
49 - 120	53,577.00	92.81	11,475.00	250.00
121 - 240	84,976.00	92.81	14,175.00	250.00
241 - 672	92,147.00	92.81	92,147.00	92.81
673 - 1332	125,120.85	92.81	125,120.85	92.81
1335 and up	217,267.85	92.81	217,267.85	92.81

31 Maine PUC ex parte Comments, p. 23.
32 Sprint ex parte Comments

7. Structure Sharing:

The BCPM model assigns a very high percentage of pole costs, manholes and buried structure placement costs to telephone operations. Various commenters, including the Hatfield sponsors, disagree with the assignment of such a high percentage. Based on a composite of recommendations of commenters,33 we recommend the use of the following structure assignments for use as inputs in the BCPM model:

Structure Costs (all density groups)	Percentage Assigned to Telephone Operations	
	BCPM Default	Recommended
Plow	100%	100%
Rocky Plow	100%	100%
Trench & Backfill	85 - 100%	66%
Rocky Trench	85 - 100%	66%
Backhoe Trench	85 - 100%	66%
Hand Dig Trench	85 - 100%	66%
Bore Cable	85 - 100%	66%
Push Pipe & Pull Cable	85 - 100%	66%
Cut & Restore Asphalt	85 - 100%	66%
Cut & Restore Concrete	85 - 100%	66%
Cut & Restore Sod	85 - 100%	66%
Poles	50%	50%
Anchors & Guys	100%	100%
Conduit Manholes	75 - 100%	66%

33 Ex parte comments of Maine PUC, February 14, 1997; GTE, February 20, 1997; Sprint, March 21, 1997;