EX PARTE OR LATE FILED

AT&T

Richard N. Clarke

Room 5462C2
295 North Maple Avenue
Basking Ridge, New Jersey 07920
(908) 221-8685

February 27, 1998

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M. St., NW, Room 222
Washington, D.C. 20554

RE: Ex Parte Presentation – Proxy Cost Models
CC Docket No. 96-45

Dear Ms. Salas:

Over the course of the last month, the BCPM model sponsors ("BMS") have made several ex parte submissions apparently intended to respond to comparisons between the HAI/Hatfield 5.0 Model (HM) and the BCPM3 model made by the HMS in ex parte submissions dated December 23 and 24, 1997 (HMS1) and January 6, 1998 (HMS2). Based on our review of these paper documents, it appears that the BMS are making a number of highly inaccurate statements about the HAI 5.0 model.

The first of these submissions, dated January 12, 1998 (and henceforth called BMS1) largely recites several of the BMS' previous false criticisms of geocode methods to locate customers and the HM's use of the geocodes. In addition, BMS1 describe several of the major revisions that would need to be made to the BCPM3 for it to incorporate some of the valuable geocode information that is used currently by the HM. The second submission (BMS2) was made on January 15, 1998 and addresses the deficiencies that HMS2 identified in the BCPM3's engineering of the local telephone network. This submission is notable mostly for not addressing a large number of the significant modeling deficiencies in the BCPM3 found by the HMS2. The third submission (BMS3), dated January 28, 1998 is the most awkward. This submission takes the nonsensical position that the BCPM3 uses geocoding to a greater extent than the HM. Then, apparently in response to the numerous questions that the BMS have been receiving as to why their model does not use customer location geocoding as does the HM, BMS3 describe several ways in which the BCPM3's contrived road location methodology could be radically altered to accommodate a small portion of the information available from customer geocodes. In all events, even with these proffered changes, the BCPM3's proposed use of geocoding still would fall short of the HM's *current* use of customer geocodes. The final two of these submissions, dated January 30 and February 2, 1998 (BMS4), reiterate at a high level, in even less accurate form, most of the BMS' ancillary attacks previously levied against the HAI Model.

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The attached document, "Modeling Customer Location and the Local Telephone Network: HAI/Hatfield Model 5.0 vs. BCPM3" addresses the issues raised by the BMS in BMS1, BMS2, BMS3 and BMS4. In the interest of brevity, it does not repeat the analyses provided in HMS1 and HMS2. It focuses strictly on the most significant issues, demonstrating that the arguments advanced by the BMS in support of the BCPM3 and in denigration of the HAI Model are either false, or irrelevant. Because of vehemence with which the BMS make two of their arguments, they are addressed in this letter, as well.

The first of these arguments relates to geocoding. Among the most significant statements made by the BMS is that the Metromail residential database used by the HAI Model contains only 74.4 million records. As indicated in the clear, direct statement from a Metromail executive (attached to HMS1) and verified by PNR, this is not true. The actual size of this database is about 98 million records – 30% larger than the figure alleged by the BMS. To put this 98 million number in perspective, the FCC's "Trends in Telephone Service" report (dated February 1998, Table 15.1) puts July 1997 total households at 102.3 million, and households with telephones at 96.1 million. A second major allegation in BMS1 is that the HAI Model fails to make use of significant information contained customer geocodes. Although this specious allegation is refuted in detail in sections 7 and 11.1 of the attached paper, a few principles should be reiterated.

1. The HAI Model *currently* uses customer geocodes to help count customers by Census Block; to determine where customers are located within Census Blocks; to identify clusters of customer locations; and to route distribution cable between and within clusters.

2. It is truly ironic that the BMS focus their complaints about HAI Model geocodes on their allegation that the HAI Model makes no use of significant information contained in these geocodes. Not only is this false, but, presumably, what BMS means here is that the HAI Model does not go to full "strand mapping" of cable to customers. It is useful to recite, verbatim, what the BMS told the Commission on October 17, 1997.

> 3. STRAND MAPPING
>
> Other than generalized conceptual descriptions and illustrations, we know nothing of the method by which the cost of distribution plant (where the bulk of the cost of constructing a local network is found) would be calculated under the Hatfield strand mapping proposal. Furthermore, the concept of designing a telephone network by "connecting the dots" or finding the "shortest piece of string" that connects all customers (or at least those which Hatfield has found on their mailing lists) is inappropriate. This is not the way telephone networks are built. Aside from the unreasonableness of the "as the crow flies" concept of plant placement, a real telephone company must stand ready to serve all customers, wherever they request service in the service territory, on several days notice. This concept would not be compatible with the BCPM architecture.[1]

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[1] *Joint Comments of BellSouth Corporation, BellSouth Telecommunications, Inc., U S West, Inc., and Sprint Local Telephone Companies to Further Notice of Porposed Rulemaking Sections III.C.5, 7, 8 & III.D Platform III.B.3 & III.C All Inputs and IV and V,* CC Docket Nos. 96-45 and 97-160, October 17, 1997, pp. 6-7.

3. The way in which BMS3 proposes that some *future* revision of the BCPM3 *might* use customer geocodes is strictly to assign customer locations to grids. It proposes no use of geocodes for counting customers, for clustering customers,[2] or for routing distribution cables.

The second argument advanced by the BMS is that the HAI Model relies too extensively on unverifiable, proprietary data. Not only is this argument false, but it is astonishing that given BCPM3's reliance on proprietary data from StopWatch Maps, PNR and Associates, Bellcore's SCIS and U S West's SCM switching cost models and a U S West signaling cost model, that the BMS would levy this argument solely against the HAI Model. In any event, the data in the HAI Model are verifiable, and the BMS just have not been willing to follow appropriate procedures to determine this. All of these issues are laid out and answered in a second attachment to this letter which is an Affidavit supplied by Richard N. Clarke of AT&T to the Minnesota Public Utilities Commission.

Two copies of this Notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206(a)(2) of the Commission's rules.

Sincerely,

Richard N. Clarke/ha

Richard N. Clarke

Attachments

cc:	Sheryl Todd	Natalie Wales
	Brian Clopton	Brad Wimmer
	Chuck Keller	Mike Riordan
	Bob Loube	Don Stockdale
	Richard Smith	Gary Biglaiser
	Pat DeGraba	Stag Newman
	Lisa Gelb	Michael Kende

[2] Note, that although the BMS frequently term the assignment of customer locations to grids as "clustering," nothing could be further from the truth. Grids are arbitrary artificial geographical constructs. Clusters imply proximity among customers within the cluster, and distance from customers outside of the cluster. The PNR Spatial Clustering Module used by the HAI Model is the only mathematical algorithm used by any cost model that determines real clusters based on actual telephone plant engineering criteria.

Scorecard Update

Modeling Customer Location and the Local Telephone Network: HAI/Hatfield 5.0 vs. BCPM3

AT&T and MCI

February 27, 1998

1.Unit of Measure

Issue: What unit of measure should be used to count customer locations for universal service purposes. The major alternatives are (in order of count size): total housing units (inhabited plus uninhabited), total households (equivalent to housing units that are inhabited), or households with telephones. Because uninhabited housing units, or households without telephones, tend to be located in more remote areas than households with telephones, the larger the number selected for cost modeling, the higher will be the calculated cost of universal service.

Update: Although the BMS still appear to advocate that subsidy support should be calculated as if LEC networks served every housing unit (whether occupied or not), the BMS have been providing USF cost estimates assuming that only households with telephones are served.

2.Count of Residence Customer Locations by Census Block

Issue: Because the LECs do not report residence customer location counts by Census Block (CB), each model must estimate the number of customer locations to receive service in each CB.

Update: BMS1 appears not to dispute the superiority of the HM's residential customer location counts. Instead, the BMS mount a collateral attack on the proprietary nature of PNR's National Access Line Model ("NALM"). Curiously, BCPM3 itself uses business location counts from this same proprietary PNR model.

3.Count of Residence Customer Lines by Census Block

Issue: Not all residence locations demand the same number of lines. Penetration of primary and secondary residence lines must be calculated by CB.

Update: BMS1 believes that its potential use of "actual wire center line counts," should they become available, moots this issue. BMS1 also questions the validity of PNR estimation methodology for second lines.

Because wire centers typically serve many CBs, it is unclear how use of "actual wire center line counts," would allow CB-specific determination of residence first and second line penetration. If this putative wire center-level data were useful in this regard, it certainly would be available to the HM, as well. And again, it is curious that BMS1's concern over the proprietary nature of the residential portions of PNR's NALM has not kept

BCPM3 from finding the PNR NALM's business line estimates (which BCPM3 uses) to be inadmissible. In all events, it would be interesting to know how BCPM3 intends to comport consistently, by wire center, its counts of residence and business locations to any wire center-specific line counts.

4. Count of Business Customer Locations and Lines by Census Block

Issue: Because the LECs do not report business customer location counts by Census Block (CB), each model must estimate the number of customer locations to receive service in each CB.

Update: No change, both models use PNR's NALM to generate business line and location estimates.

5. Location of Customers Within a Census Block

Issue: CBs can be quite large – especially in rural areas. Because it is much more costly to engineer distribution plant to customers dispersed across a CB than concentrated in a single cluster, it is vital that customer locations within a CB be determined precisely to ensure that plant is modeled to match the specific configuration of customer locations.

Update: By reference to undocumented "correlation" studies and apparently a small unfiled selection of satellite or aerial photos, BMS1 continues to maintain the validity of its assumption that all customers are uniformly distributed along its selected roads. Given BMS' past admissions that satellite photos were less than useful at discriminating telephone customer locations, and its prior invalid attempt at inferring customer locations from a defective aerial photograph at the FCC's September 10, 1997 workshop on customer location, it is surprising that the BMS continue to promote these methodologies – especially when dispositive geocode data is available from the HM.

In addition, the BMS refer to certain vague analyses that it has done on the Vernon and Albany, Texas wire centers, and claim to find that BCPM3 does a superior job to the HM at locating customers. This conclusion is unsurprising given that the BMS declare BCPM3 to be a "success" at locating a customer it a single SWB customer geocode in an entire ultimate grid that BCPM3 has determined to contain occupied or unoccupied housing units. Because these ultimate grids are six square miles or more in size in rural areas, it is an extremely generous "target" for the BMS to

draw for BCPM3.[1] But when evaluating the HM's success, BMS1 appears not to use the complete set of customer address data from Metromail and D&B that are used in the HM; and BMS1 chooses as its denominator for measuring the success of these geocodes total occupied plus unoccupied housing units – rather than households with telephones.

In contrast, the dispositive geocode data used by the HM demonstrate the following common sense facts.

- Many of BCPM3's roads contain no geocoded customer locations;
- Many geocoded customer locations are not located on any of BCPM3's roads;
- On the roads where customers are located, the degree of customer dispersion varies widely, even within compact areas.

6.Assignment of Locations to Wire Centers

Issue: To ensure that customers are served by their present wire center, it is important that customer locations be associated with the wire center providing service to that area.

Update: Little disagreement. Both model use principally the same BLR data.

7.Reasonableness and Stability of Cluster Dimensions

Issue: Clusters should conform to reasonable telephone plant engineering limitations, and these limitations should be implemented in a stable consistent fashion across the U.S. Among the important engineering restrictions are: maximum distance an analog copper loop can carry a quality signal and maximum number of lines supportable by a single DLC installation.

Update: The BMS appear not to dispute that the BCPM3's grid sizes may vary by up to 200% from north to south because of its use of distance-varying 1/25° latitude and longitude meridians as its "cluster" boundary delineators. The BMS also fail to explain how the BCPM3 intends to correct for the systematic cost biases (e.g., grids in the south that are identical to those in the north receive less universal service support) caused by this feature of

[1] Actually, the BMS are even more generous in using "matches" at the ultimate grid level as their "success" criteria for BCPM3. This is because in actuality, the BCPM3 only engineers distribution plant to a tiny fraction of their ultimate grid known as their "road-reduced squares." It would be extremely instructive if the BMS would provide the BCPM3's "success" rate at locating SWB customer geocodes within the "road-reduced squares" to which BCPM3 actually engineers distribution plant. See item 7, below, for more information.

BCPM3. Furthermore the BMS appear also not to dispute that the BCPM3's chosen grid structure will permit the analog copper loops that it engineers to exceed 18,000 feet in length.

Instead, BMS1 counterclaims that HM clusters may be large – and implies that this is bad; and that BCPM3 grids are small – and implies that this is good. Tellingly, the BMS do not claim that HM clusters violate its "no point further than 18,000 feet from the cluster centroid rule." Furthermore, even though less than 18,000 feet of distribution plant is required to reach any point in an HM cluster (on a right angle basis), because the HM Distribution Module engineers non-highrise, main cluster plant using rectangular backbone and branch arrays, the HM Distribution Module splits any cluster that would not meet this more stringent requirement. In contrast, the inflexible customer location and engineering algorithms and assumptions of the BCPM3 require it to use inefficiently small distribution areas in order to provide just partial adherence to service quality criteria. And equally important, while the maximum analog copper loop distance in the HM is user adjustable (with a default of 18,000 feet), while BCPM3's selected target threshold of 12,000 feet is hardwired into its preprocessing algorithms, and is not adjustable by the model's user.

8.Clustering of Located Customers

Issue: To economically engineer telephone distribution plant, it is vital that customers that *can* be served efficiently from a common installation (such as a DLC RT) *are* served by that installation. By locating and serving together customers that are spaced close enough to adhere to standard loop engineering specifications, these efficiencies may be ensured.

Update: Nothing new to report. The BMS provide no further defense of the BCPM3's "unguided cookie cutter" approach. In contrast, the HM 5.0's optimizing mathematical clustering algorithm is based on actual customer locations and follows normal engineering restrictions.[2]

9.Calculation of Served Area Within Cluster

Issue: The amount of distribution area over which cable is laid is a key driver of OSP costs.

Update: The BCPM3 continues to use an arbitrarily selected 500 foot swath along each side of its roads, until the total area of the grid is exhausted, as its

[2] Based on an erasure in the BMS4 submission, it appears that the BMS finally may have withdrawn their unfounded claim that the code of this cluster algorithm has been kept secret.

measurement of area requiring the placement of distribution plant.[3] In rural areas (where lots exceed 500 feet in depth), this appears to lead to an astonishing understatement of distribution area. As the attached table demonstrates, BCPM3 places distribution plant across only 28% of Iowa, or 32% of Illinois – states whose geographies are almost completely populated. BCPM3 even appears to believe that New Jersey is only 45% populated. Because the HM uses customer geocode data to determine how much area must be served, it does not make errors such as arise from BCPM3's arbitrary and nationwide selection of a 500 foot swath.[4]

10.Location of Served Area Within Cluster

Issue: Determines location of SAIs and potential distribution cable lengths.

Update: BCPM3 assumes artificially that distribution plant need only be placed in small square areas calculated via its artificial "road-reduction" methodology, and located at the road centroid of the grid or grid quadrant where BCPM3 assumes that customers are located. This process moves customers from their assumed location within the microgrid where their "road" was located, to a distribution area that may be remote from that microgrid – and which in actuality may contain no customers or roads.[5] DLCs are placed at the "road centroid," a location where there may also be no customers or roads. It is difficult to understand why this layering of inaccurate arbitrary methodologies should yield an accurate assessment of distribution costs. In contrast, the HM methodology places DLCs and distribution plant within the cluster where telephone customers have been located. A chart attached as Appendix A to this submission displays these BCPM3 and HM methodologies in more detail.

11. DISTRIBUTION

11.1. Cable Configurations

Issue: Once customers are located, the models must place loop distribution plant to serve these customer locations. If a model does not place distribution plant in conformity to how customers are located, it is likely that distribution costs will be calculated incorrectly.

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[3] This process is called BCPM3's "road-reduction" methodology.

[4] This turn of events is truly ironic. One of the main complaints that the BMS had about earlier versions of the HM was its assumption of customers clustered into small areas within the CBG's quadrants – a practice which is extremely similar to what is followed by the BCPM3.

[5] Note that there is not even any assurance that customers were located on the road that the BCPM3 relocates to its square at the grid or grid quadrant's road centroid.

Update: Perhaps to distract from the fact that 100% of all distribution cable engineered by the BCPM3 is in a square backbone and branch layout, BMS1 makes the astonishing, and false, allegation that the HM disregards its customer geocodes, and serves all customers via some arbitrary backbone and branch layout. It is unclear how the BMS came to this incorrect understanding of the HM's methodology, nevertheless, the HMS will refute it in detail.

First, the HM does not ignore the geocoded customer locations in specifying its clusters. The boundary points of the cluster polygons are used to determine the configuration of a rectangle (not a square as is used inflexibly by the BCPM3) with identical aspect ratio (i.e., north/south versus east/west dimension) and identical centroid location (not removed to the "road centroid" of the grid/quadrant as is done by the BCPM3). Second, between and within these rectangles, the HM does not follow BCPM3's practice of engineering 100% backbone and branch distribution cables. In particular, the HM departs from this lockstep engineering pattern in at least three important instances. First is that the HM uses daisy chain T1 distribution cables to link its outlier clusters back to a DLC remote terminal located at the centroid of the nearest main cluster. Second, within outlier clusters, the HM engineers distribution plant to the one through four customer locations that may exist within an outlier cluster via "subscriber road cable" configurations that comport with the geocodes of each of the locations.[6] Finally, in high density high rise situations, the HM engineers distribution cable as vertical block and riser cable. Thus, only in the middle density zones does the HM use exclusively a backbone and branch configuration.[7]

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[6] Charts describing more clearly how the HM determines these road cable configurations were filed ex parte by AT&T on February 13, 1998. They are reattached here as Appendix B.

[7] BMS1 raises an irrelevant issue when it complains that cables directed in cardinal N/S/E/W directions in the HM use the V&H coordinate system rather than the latitude and longitude coordinate system. Although V&H directions may be rotated up to 30° from lat/long directions. There is no basis for any concern. Because a mile of cable costs the same no matter whether it is pointed 90° E, or 60° ENE, there is no inaccuracy in HM cost modeling if the entire rectangular distribution area is rigidly rotated by 30°. For the record, the reason why the HM uses V&H for cable routing is that although customer locations are input to the HM in lat/long terms, wire center locations are input in V&H terms. Because these two items need to be specified consistently, one of the two coordinate systems had to be converted into the other. HM 5.0 chose to convert the customer location lat/longs into V&H. If the Commission has a preference all locations being stated in terms of lat/long, it is a straightforward process for the next version of the HM to convert its wire center V&H locations into lat and long, and use lat/long coordinates throughout. It will not have any significant effect on the model results, however.

11.2. Lot Dimensions

Issue: Lot dimensions directly affect facility investment for telecommunications, as well as investment in roads, sidewalks, and grass medians. A model must make assumptions regarding lot sizes and shapes.

Update: No change in positions of parties. BMS advocate assuming square lots, HMS advocate 2:1 rectangular lots.

11.3. Efficient Choice of Structure Type

Issue: Telecommunications plant structure is typically chosen to minimize route costs, subject to various zoning, security and esthetic constraints. Models should recognize that local conditions may present OSP engineers with varying structure costs, and that the structure selected in these localities should be consistent with cost-minimization.

Update: BMS2 agrees that it does not take into account all economic factors that might drive economic choice of structure type. The reasoning provided by BMS2 for its partial analysis is that, "Most engineers do NOT [emphasis in the original] consider structure sharing in economic analysis." This is an especially curious statement. If it were correct, it would suggest that all utility structures would be sized to serve only the structure owner's usage, i.e., a telephone company would place only 30 foot poles because this is all the height that is likely to be needed for telco use. Because LECs do place 35, 40 and 45 foot poles, and because they do place multiple conduits in a trench, this is clear proof that the potential economies from structure sharing are driving their engineering decisions. Thus, BCPM3's deliberate omission of these factors seems inconsistent with actual economic telco practice.

12.FEEDER STRUCTURE

12.1. Feeder Steering and Design

Issue: How do the models direct the main feeder to each distribution area? Is the routing on a right angle basis, or some adaptive steering mechanism. Are the direction algorithms sound from a network engineering standpoint, and does the chosen algorithm result in a cost-efficient routing?

Update: BMS2 insists that its choice of feeder routing is optimal because it chooses between steered/split or cardinal routing based on shortest distance. BMS2

also asserts that its previously filed schematics of feeder routing should not have been relied upon by AT&T and MCI because the BMS have subsequently found them to be inaccurate. BMS2 also scores the HM for using a single route/air distance multiplier when it steers feeder.

The BMS misapprehend the meaning of the term, "optimal." Although BCPM3 may choose between steered/split or cardinal routing based on shortest distance, this decision is not optimal unless the alternatives are optimal. Because the BCPM3 only allows subfeeder to branch off of steered feeder in cardinal (non-perpendicular) directions, and because the BCPM3 does not permit the use of *any* route/air distance multiplier, it is highly unlikely that its steering/splitting methodology will provide an "optimal" alternative to cardinal routing.[8] In contrast, when the HM is directed by the user to steer feeder, its subfeeder branches perpendicularly from the main feeder, and its engineered route distances may be adjusted by a user-adjustable route-air multiplier.

12.2. Choice of Feeder Technology

Issue: Feeder may be analog copper or digital fiber. Models must select technology that minimizes costs given a service quality level.

Update: BMS2 argues that in certain special instances, BCPM3's "rule of thumb" selection methodologies may suggest reasonable results – despite their failure to consider economic life-cycle costs. BMS2 also scores HM life-cycle algorithms as "not easily user-adjustable."

Although the HM life-cycle algorithms may be complex, the economic and engineering decision making that goes into the construction of a telephone network is complex as well. It is also axiomatic that rules-of-thumb are not nearly as accurate as the more complex decision making process that they are intended to imperfectly proxy.

13.SERVING AREA SIZE AND DLC ISSUES

13.1. Sizing Serving Areas by Line Counts

[8] This deficiency of the BCPM3 was noted by USTA's consultant, Christensen Associates, at p. 9 of its attachment to USTA's January 15, 1998 ex parte presentation. In addition, because BCPM3 chooses between cardinal versus steered/split main feeder routes in its preprocessing stage, BCPM3's choice of main feeder routing is not user-selectable – or even ever revealed to the user.

Issue: Serving areas are sized to meet aggregate demand for transport via feeder facilities back to a wire center. Engineering constraints apply to serving area sizing, and should be followed based on forward looking technologies.

Update: BMS2 continues to state that serving areas should ideally be limited to roughly 1000 lines in size – and splits serving areas into quarters (not even halves) when it exceeds this threshold. It claims that this limitation is due both to the nonexistence of SAIs that can handle up to 7200 pair, and the fact that the maximum size DLC RT cabinet that is available from DSC on an OEM basis is 1344 lines. Although BMS2 agrees that DLC RT cabinets sold by other vendors, such as RELTEC, can handle up to 2016 lines, it argues that such cabinets are so large as to be precluded by right-of-way easement restrictions, etc.

First, SAIs handling up to 7200 pair, or more, are available. HUB Fabricating Corporation's product identification number for their 7200 pair outdoor SAI is the BTS-LP7200. Similarly available in the 7200 pair size is the RELTEC FSDRLS7200DDPM. Indeed, RELTEC manufactures SAIs as large as 8100 pair.

Second, BMS2's argument that 1344 line DSC cabinets are acceptable, while 2016 line RELTEC cabinets are too large to be usable, seems strained. According to the DSC literature provided by BCPM3, the DSC 1344 line cabinet is 70" high, 103.25" wide, and 45" deep. But according to RELTEC literature, its MESA 6 cabinet, which accommodates up to 2016 lines of DSC Litespan, is 72" high, 112" wide, and 46" deep. This small difference in dimensions from the DSC cabinet (2" higher, 8.75" wider, and 1" deeper) seems not be an appropriate reason for limiting by one third the maximum size of a serving area.

13.2. Ensuring Efficient Support for Advanced Services

Issue: *"The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services."*[9]

Update: The BMS continue to infer a vendor's statement that networks meeting CSA standards will work with its equipment as also implying that networks not adhering to CSA will not work with the equipment – and cites some other DSC literature as a counterpoint to the DSC Litespan Practice chart that was submitted as Figure 12 in the HMS2 ex parte. BMS2 does appear to admit that the less expensive RUVG2 extended range card is a more economical

[9] Report and Order in CC Docket 96-45, Adopted May 7, 1997, Released May 8, 1997 at Paragraph 250.

choice than the more expensive special services REUVG extended range card that it had previously specified.

14.Switching

14.1. Forward-Looking Placement of Host, Remote and Standalone Switches

Issue: Because switching technologies have evolved over time, current configurations of switches as hosts, remotes or standalones may no longer be optimal. In particular, a wire center that currently houses two switches serving a total of 40,000 lines may, on a forward-looking basis, be more efficiently engineered with a single switch. Similarly, many small standalone switches could be replaced with more efficient remotes. To model efficient forward-looking costs, models must permit the placement of a switch type in a wire center that optimizes switching costs.

Update: BMS2 claims that its dependence upon the LERG for switch placement provides a "verifiable data set to define their efficient placement." But in BMS2, the BMS reveal (apparently for the first time) that the BCPM3 selectively modifies the LERG data in order to choose a "primary" switch in a location when the LERG contains multiple switches.[10] The undocumented selection criteria for a "primary" switch and selective modification of the LERG data means that the host/remote placement data used by BCPM3 is not verifiable. Thus, the BMS have made no showing that the combination of the embedded, historical LERG data, selectively modified by BCPM3 represents an optimized forward-looking network.

In addition, BMS2 makes several spurious suggestions that the HM does not model adequately host/remote relationships. The basis for this assertion appears to be that (a) the HM's default selection is to use blended host/remote/standalone switch costs; and (b) when the HM's explicit host/remote modeling option is turned on, its host/remote relationships do not default to those in the LERG. Neither of these "reasons" should be taken seriously.

14.2. Use of Proprietary Models

Issue: The FNPRM has required that all submitted cost models be open, and subject to public scrutiny. Use of proprietary models to determine costs

[10] This raises questions about what switch placements are actually used in BCPM3. For example, what happens to the LERG-based remote/host linkages that may have been severed by BCPM3?

defeats this goal, and raises questions about the integrity of the modeling process for developing universal service costs.

Update: BCPM relies on detailed disaggregation of switching investments into functional sub-categories.[11] Despite BMS2's claims that this is a data input issue, this is a structural dependence of BCPM on Bellcore's SCIS model and/or US West's SCM model to perform the disaggregation. Indeed, even the definitions of the functional categories are directly related to these models and BCPM3 has proposed no alternatives to using these proprietary models as the very foundation of BCPM3 switching. The functional categories are an inherent structural part of the BCPM3 platform.

14.3. Consistency of Input Values

Issue: Switching models may take data from different sources. These sources should provide data on a consistent basis with each other so that source-shopping is not used to manipulate results.

Update: BMS2 has responded to HMS2's specific example of a functional category that is different between BCPM3's foundation SCIS and SCM models by stating, "this feature was included to allow the BCPM user to place the investment into the category consistent with the user's Unbundled Network Element (UNE) studies." Although the meaning of this quote is unclear, it appears that Bellcore has added a user option to modify the SCIS logic to enable it to conform to SCM at the request of the BMS. If these categories can be "gamed" and do not represent objective functional classification criteria, then they certainly should be rejected as foundations for BCPM3.

BMS2 admits that there are significant inconsistencies among the foundation models when they state "The BPCM sponsors have created a mapping process that accurately, but not perfectly in every case, matches the SCIS and SCM inputs." This revealing comment raises concerns that significant jockeying of the use of BCPM3's foundation models is taking place, thereby eradicating any purported integrity of the SCIS and SCM models claimed by the BMS. BMS2's claims that there are more differences between the 5ESS and DMS100 than the models is irrelevant. A good model should capture differences between the technologies, but mixing and matching different modeling methodologies is simply wrong. The entire notion of using proprietary models, selectively modified through

[11] The HMS do understand that the switching investments from these models are data inputs and are one of three alternatives. We are not referring to the overall level of switching investment, but specifically to the need of BCPM3 to have switching investments in the form of detailed functional subcategories.

completely undocumented processes by BCPM3 confirms that BCPM3's entire structural dependence on these models is a severe flaw.

14.4. Validity of Modeled Cost Development

Issue: Within the open and operational modules of the cost model, the development of switching costs should be logically sound and accurate.

Update: BMS2 has indicated that the HMS2 interpretation of its regression logic was incorrect. Although this could be the case, the real issue is that the details of these regressions are undocumented. And this is more than a data input issue. BCPM3 is dependent on the logic of these regressions for the functional disaggregations of switching investment, making it a structural issue as well. The BMS have not provided any evidence or documentation of this cost structuring, other than to point to the actual ALSM results, which are proprietary and not available.

14.5. Cost Allocation Issues

Issue: For switching costs to be reliable, they must be associated correctly with their cost drivers.

Update: This issue is primarily about how a host/remote complex's costs are allocated. According to BCPM3's Methodology documentation, page 65, the table indicates that the processor costs are allocated by rate center. There is still significant confusion regarding BCPM3's allocation of host/remote complex's costs, highlighting the fact of inadequate documentation.

The second issue is the line concentration ratios assumed by BCPM3. BMS2 misunderstands the HMS2 comments to apply to line to trunk ratios, which they did not.[12] The HMS2 item referred to the BCPM Model Methodology section 7.3.3.1 that discusses line concentration ratios. The HMS concern is that if the line concentration ratios that were input to SCIS and SCM correspond with the BCPM description of one speech link for every two to six link terminations, then cost results are vastly overstated because switches typically are engineered with line concentration ratios in the six to eight range.

[12] The HMS regret if their comments were not completely clear on this matter.

15.INTEROFFICE TRANSPORT

15.1. Forward-Looking Issues

Issue: The interoffice network modeled should be forward-looking in configuration, technology and expenses.

Update: BMS2 agrees that the BCPM3 transport module essentially replicates embedded interoffice configurations – but reasons that this does not impinge on the ability of the BCPM3 to model a forward-looking interoffice network because the user could choose to override BCPM3's embedded defaults. The BMS, however, do not indicate what truly forward-looking model the user might employ to determine the transport parameters that would need to be inserted into the BCPM3 to force the engineering of an efficient transport network.

BMS2 also explains that the BCPM3 uses antiquated manual cross-connects rather than digital cross-connects (DCS) because ILECs rarely rearrange their local interoffice trunks. BMS2 also suggests that DCS are used primarily for special services. Although this latter item may be true, it does not follow that not using DCS for switched service circuits is the most cost effective. Given that ILECs currently appear to be equipping all of their significant end offices with DCS technology, the BCPM3 determination to use manual cross-connects appears uneconomic.

Finally, BCPM3 attempts to shift the focus off of their model's nonforward-looking calculations by making the absolutely false statement that the HM interconnects offices using nonredundant point-to-point transport routes. The BCPM3 provides no cites to the HM 5.0 documentation to support this allegation. It appears likely that the reason why BMS2 makes this spurious allegation about the HM is because they have chosen to interpret language in the HM 5.0 documentation that refers to redundant point-to-point facilities as something different from the facilities that BCPM3 refers to as "folded rings." Indeed, both are the same: SONET rings that link exactly two network nodes.

15.2. Engineering Issues

Issue: Are transport networks engineered as ILECs engineer them: to serve the ILEC's interoffice demand in an economical and reliable fashion?

Update: BMS2 appears not to dispute the following HMS2 statements about BCPM3's interoffice networks:

- The model will intersperse multiple companies' wire centers *on the same ring*. Rather than disputing this observation, the BCPM3 offer up an irrelevant counterargument that large ILECs must interconnect with small ILECs and CLECs. The HMS do not dispute this point. They only observe that this type of interconnection typically occurs via a spur connection from the large ILEC's ring to the network. The small ILEC's or CLEC's wire center does not become a node on the large ILEC's ring so that all of the ILEC's own ring traffic must transit the small ILEC's or CLEC's wire center.
- The model attempts to equalize the number of nodes on the rings so that all rings contain about the same number of nodes – without regard to whether this is cost-optimal.
- No investments are computed for inter-ring connections or inter-tandem connections. In response, BMS2 reiterates its belief that all intertandem traffic is toll traffic. This is not true in many LATAs that have multiple tandems (the New York, Chicago and Los Angeles LATAs are examples).
- The transport and switching modules operate independently. Although BMS2 does not dispute that its transport module will not engineer trunks to a wire center as the same ratio of lines at that wire center as its switching module will engineer trunk ports, the BMS indicate that their transport module does use two different trunk to line ratios: one for host/tandem trunks, and a second for host/remote trunks. While this is better than using a single ratio, it does not explain why BCPM3 chooses not to use, on a wire center by wire center basis, the precise ratio that was determined by the traffic engineering performed in its switching module.
- The BCPM3 requires the tandem to be a node on every ring – leading to a highly inefficient ring structure. BMS2's sole response to this point is to observe that the host/remote rings engineered by BPCM3 are not required to pass through a tandem. BCPM3 apparently agrees that all of their rings interconnecting host or standalone switches are engineered to pass through tandems – despite the inefficiency of this arrangement.

16.Signaling

Issue: Signaling is an important element of network costs. As local telephone numbers become portable, it becomes even more important to model correctly the cost of signaling services.

Update: USTA consultant, Christensen Associates agrees that BCPM3 signaling costs are developed within an undisclosed and undocumented U S WEST's

proprietary signaling – and then exogenously inserted into the BCPM3. BCPM3 does explain, however, that their "reason" for constructing a two layer signaling network (i.e., local and regional STPs) is to handle the signaling demand of local number portability ("LNP"). Given that LNP database queries are destined to become the type of database query, it is odd that BCPM3 would find it most efficient to connect local switches with the LNP database via an extra STPs and an extra D-link (the signaling equivalent of using tandem switching).

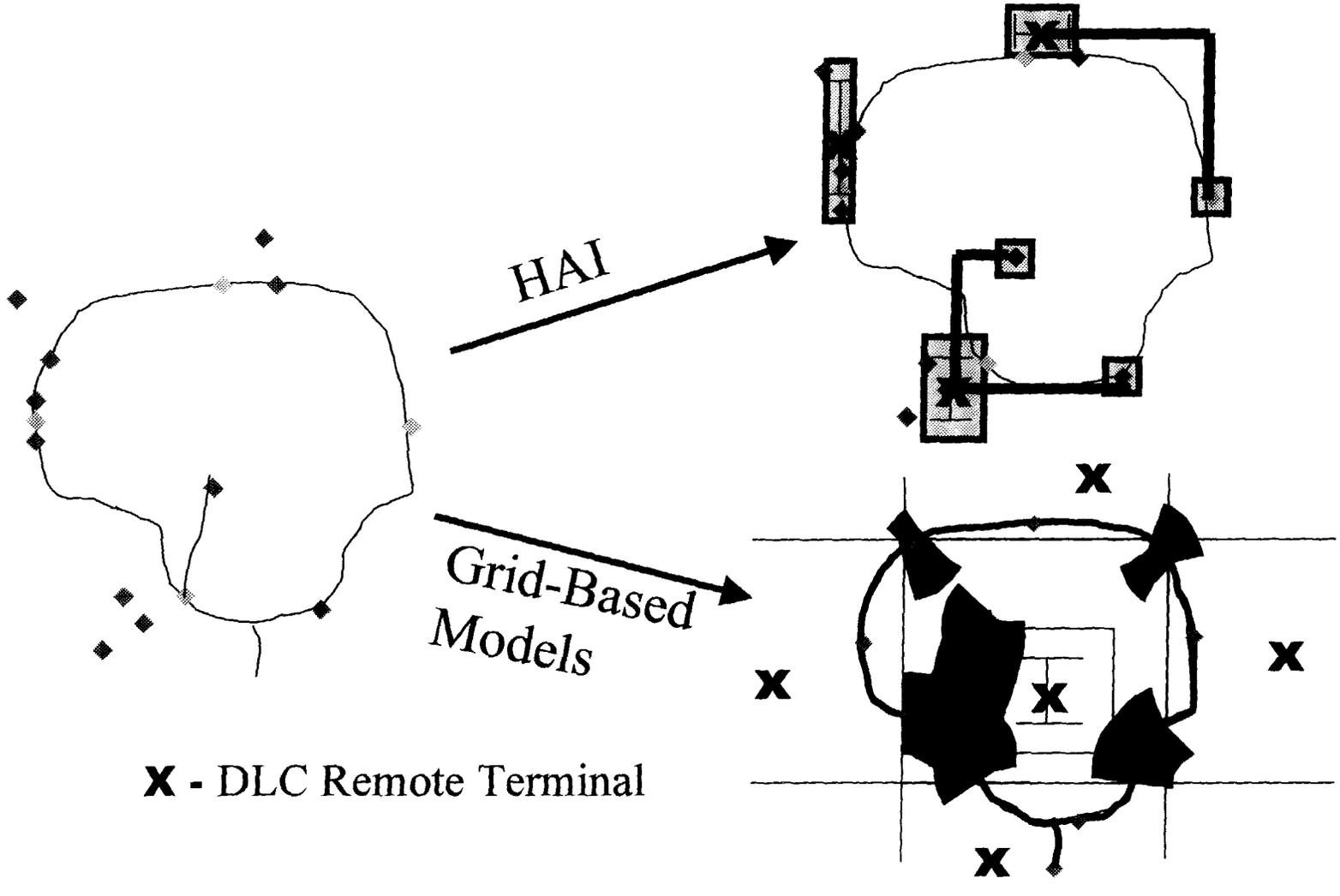
Table

COMPARISON OF DISTRIBUTION AREA

State	Total Area	Land Area	BCPM 3 Road-Reduced Grid Area	BCPM 3 % of Land
AK	587,875	570,374	78	0%
AL	51,718	50,750	14,080	28%
AR	53,182	52,075	12,493	24%
AZ	114,006	113,642	10,141	9%
CA	158,647	155,973	24,816	16%
CO	104,100	103,730	13,269	13%
CT	5,006	4,845	2,458	51%
DC	68	61	53	87%
DE	2,026	1,955	789	40%
FL	58,680	53,997	13,952	26%
GA	58,930	57,919	17,214	30%
HI	6,459	6,423	872	14%
IA	56,276	55,875	15,656	28%
ID	83,574	82,571	7,778	9%
IL	56,343	55,593	17,559	32%
IN	36,185	35,870	12,520	35%
KS	82,282	81,823	16,158	20%
KY	40,411	39,732	12,309	31%
LA	47,719	43,566	9,896	23%
MA	8,262	7,838	3,730	48%
MD	10,455	9,775	4,109	42%
ME	33,128	30,865	4,699	15%
MI	58,512	56,809	17,006	30%
MN	84,397	79,617	18,153	23%
MO	69,709	68,898	18,872	27%
MS	47,695	46,914	12,387	26%
MT	147,046	145,556	12,402	9%
NC	52,672	48,718	16,383	34%
ND	70,704	68,994	10,790	16%
NE	77,358	76,878	13,244	17%
NH	9,283	8,969	2,409	27%
NJ	7,790	7,419	3,357	45%
NM	121,598	121,365	11,187	9%
NV	110,567	109,806	3,083	3%
NY	49,112	47,224	14,656	31%
OH	41,328	40,953	15,343	37%
OK	69,903	68,679	15,951	23%
OR	97,052	96,003	10,916	11%
PA	45,310	44,820	17,210	38%
PR	3,435	3,421	1,409	41%
RI	1,213	1,045	586	56%
SC	31,117	30,111	10,079	33%
SD	77,123	75,898	10,408	14%
TN	42,146	41,220	13,427	33%
TX	266,873	261,914	60,976	23%
UT	84,904	82,168	4,441	5%
VA	40,598	39,598	13,252	33%
VT	9,615	9,249	2,289	25%
WA	68,127	66,582	10,816	16%
WI	56,145	54,314	15,330	28%
WV	24,231	24,087	6,758	28%
WY	97,818	97,105	5,848	6%
TOTAL	3,618,713	3,539,586	583,593	16%

Appendix A

Clustering Customers



Appendix B

Main Cluster:
Backbone and Branch Cable Calculations

Assume:

Area of distribution area = A

Aspect (H/W) ratio of area = r

Width of distribution area = $(A/r)^{1/2}$

Height of distribution area = $(Ar)^{1/2}$

Number of customer locations = N

Lot depth to width ratio = 2:1

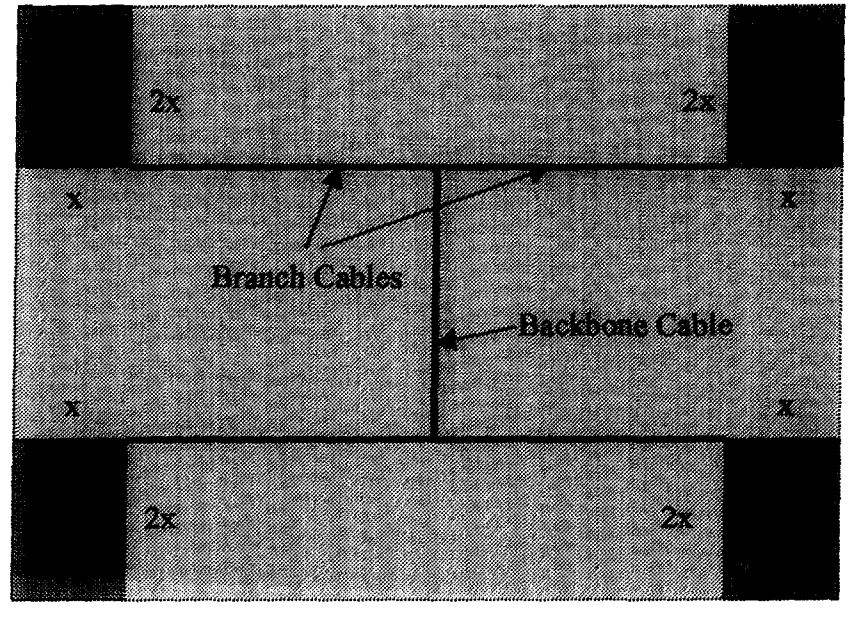
Then:

Area per location = $A/N = x \cdot 2x = 2x^2$

(where x=lot width, and 2x=lot depth)

Lot width = $(A/2N)^{1/2}$

Lot depth = $(2A/N)^{1/2}$



Thus:

Backbone cable length = $(Ar)^{1/2} - 4x$

$2 \times$ Branch cable length = $(A/r)^{1/2} - 2x$

Appendix B

Outlier Cluster:
1 and 2 Location Road Cable Calculations

<u>1 Customer Location</u>

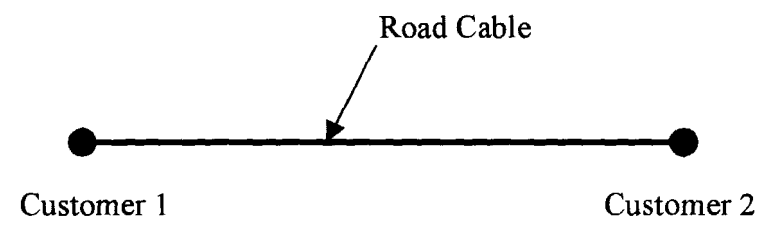
No road cable calculations:

Single customer location is at centroid of cluster

<u>2 Customer Locations</u>

Road cable calculations:

Single road cable with length to link the 2 customer locations



Appendix B

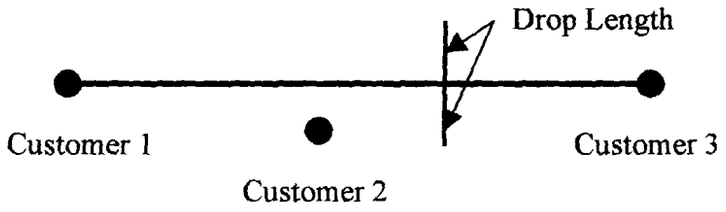
Outlier Cluster:
3 Location Road Cable Calculations

<u>3 Customer Locations</u>

Two Situations:

A) All customers are within ±1 drop length of being colinear

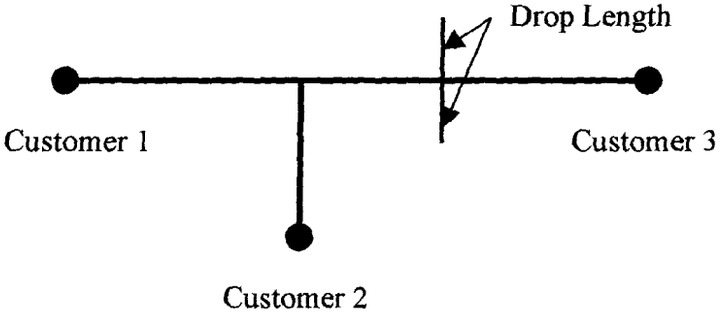
Single road cable length is distance between two locations farthest from each other (major axis of the cluster). Customer 2 is served by drop wire off of road cable.



B) Customers are not within ±1 drop length of being colinear

Primary road cable length is the distance of the major axis of the cluster.

Secondary road cable is a spur of primary with a length equal to the minor axis of the cluster.



Appendix B

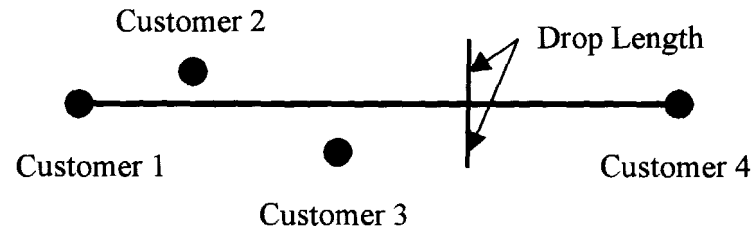
Outlier Cluster:
4 Location Road Cable Calculations

4 Customer Locations

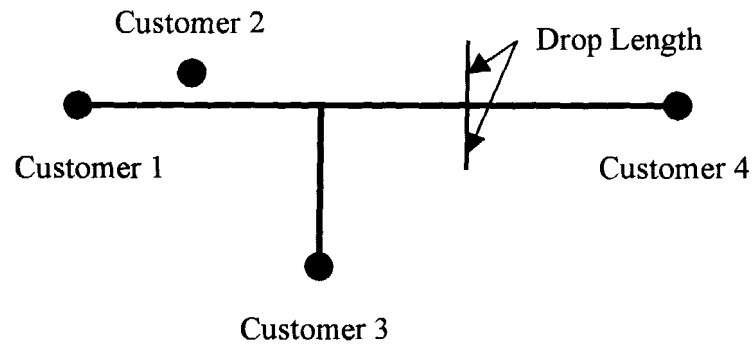
Three Situations:

A) All customers are within ±1 drop length of being colinear

Single road cable length is distance between two locations farthest from each other (major axis of the cluster). Customers 2 and 3 are served by drop wire off of road cable.



B) Three customers within ±1 drop length of being colinear

Primary road cable length is the distance of the major axis of the cluster.

Secondary road cable is a spur of primary with a length equal to the minor axis of the cluster.