COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

D.T.E. NO. 01-20

REQUEST: Verizon Massachusetts Information Requests to AT&T Communications of New England, Inc.

DATE: May 29, 2001 – Original Response
August 23, 2001 – Supplemental Response

VZ-ATT 1-34: With respect to the "changes in the default values" referenced at page 7 of the Model Description, provide a listing of the old and new values and a detailed explanation of the basis for each change. Identify all changes in the default input values from HAI Model, Release 5.0a to HAI 5.2a.

Respondent: R. Mercer/J. Donovan

RESPONSE: AT&T objects to this information request on the grounds that the information sought is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence. The only version of the HAI Model relevant in this proceeding is HAI 5.2a-MA which was filed with Dr. Mercer's testimony. Subject to and without waiving this objection, AT&T states that if Verizon-MA wishes to examine other versions of the HAI Model, it can obtain all versions filed with the FCC from the International Transcription Service in Washington, D.C.

As noted in Dr. Mercer's testimony, the Model has benefited enormously from several years of scrutiny by regulators and by other, often hostile, parties, as well as by the continued review of the Model developers. Throughout this process of review and scrutiny, when presented with convincing support for an input value different from the existing default value, the developers of the Model have been willing to adopt the new value. In each case, the support upon which the "new" value is based has been added to the HAI HIP. Where a value differs between a previous version of the HAI Model and HAI 5.2a, the change was made because the support for the HAI 5.2a-MA value was considered by the Model's developers to be more current and based on more complete data than the value used in the previous version.

SUPPLEMENTAL
RESPONSE: See the attached side-by-side comparison of HM 5.0a and HM 5.2a default inputs. As stated in AT&T's original response to this information request, each change in a default input between the two versions of the model was made because the model developers considered the support for the value used in HM 5.2a (as stated in the respective sections of the HM 5.2a HIP) to be more current or based on more complete data than the value used in the HM 5.0a. Due to its voluminous nature, the attachment to this response is being provided in electronic format only.

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REQUEST: Verizon Massachusetts Information Requests to AT&T Communications of New England, Inc.

DATE: May 29, 2001 – Original Response
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VZ-ATT 1-57: Identify who owns HAI 5.2a and describe in detail the scope and extent of each owner's rights to the model.

Respondent: R. Mercer

RESPONSE: AT&T objects to this information request on the basis that it is irrelevant and not calculated to lead to the discovery of admissible evidence.

SUPPLEMENTAL RESPONSE: The copyright to HM 5.2a is held jointly by HAI, AT&T and WorldCom. The owners make joint decisions as to its use.

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D.T.E. NO. 01-20

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DATE: May 29, 2001 – Original Response
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VZ-ATT 1-58: Is AT&T free to release or sell HAI 5.2a to other companies for use outside of this or any other regulatory proceeding?

Respondent: R. Mercer

RESPONSE: AT&T objects to this information request on the basis that it is irrelevant and not calculated to lead to the discovery of admissible evidence.

SUPPLEMENTAL RESPONSE: See Supplemental Response to VZ-ATT 1-57.

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D.T.E. NO. 01-20

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DATE: May 29, 2001 – Original Response
August 23, 2001 – Supplemental Response

VZ-ATT 1-59: If the answer to data request no. 58 is yes, identify the terms under which HAI 5.2a may be released.

Respondent: R. Mercer

RESPONSE: See response to VZ-ATT 1-58.

SUPPLEMENTAL
RESPONSE: See the Supplemental Response to VZ-ATT 1-58.

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D.T.E. NO. 01-20

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VZ-ATT 1-60: To the extent that the release of HAI 5.2a is restricted, state the basis for the restriction. Also, produce any and all documents concerning, referring or relating to any restrictions on the release of HAI 5.2a.

Respondent: R. Mercer

RESPONSE: AT&T objects to this information request on the basis that it is irrelevant and not calculated to lead to the discovery of admissible evidence.

Subject to and without waiving its objection, AT&T states that is does not understand what Verizon-MA means by the term "restricted." The HAI 5.2a-MA introduced in this proceeding is an open model. The Model's methodology is described in detail in the HAI 5.2a-MA Model Description, its default inputs are described and supported in the HAI 5.2a-MA Inputs Portfolio (HAI 5.2a-MA HIP), and the Model's calculations, formula, and other output are open for review and analysis by all users. Users have the capability to change input values and even to change formula and calculations in the Model, although if formula or calculations were changed, the Model would no longer be the HAI 5.2a-MA Model and could not be referred to as such.

SUPPLEMENTAL RESPONSE: See the Supplemental Response to VZ-ATT 1-58. There are no documents other than the copyright notice found in the Expense Module, "copyright notice" Worksheet.

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D.T.E. NO. 01-20

REQUEST: Verizon Massachusetts Information Requests to AT&T Communications of New England, Inc.

DATE: May 29, 2001 – Original Response
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VZ-ATT 1-65: Identify in detail how the HAI 5.2a differs from the HAI Model Release 5.2 that was filed by AT&T with the New York State Public Utility Commission. The response should identify, but not necessarily be limited to, all:

a. differences in modeling assumptions;

b. differences in input assumptions;

c. differences in default input assumptions;

d. differences in technology assumptions; and,

e. differences in platform algorithms.

Also, for each difference identified above, explain the basis for the difference.

Respondent: R. Mercer

RESPONSE: AT&T objects to this request on the grounds that the information sought is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence. The cost model sponsored by AT&T in New York is not at issue in this proceeding. In addition, because of the use of different modeling and network assumptions, a comparison of the models would be highly burdensome. Subject to and without waiving these objections, AT&T states that the cost model sponsored by AT&T in New York is publicly available in the record of the New York proceeding for Verizon-MA to obtain and review as it wishes. AT&T also notes that Verizon-MA's New York affiliate is a participant in the New York proceeding, and undoubtedly has reviewed the cost model sponsored by AT&T in that proceeding.

SUPPLEMENTAL RESPONSE:

a. Compared to the final version of the model filed with the New York Public Service Commission on January 17, 2001, there are no differences in modeling assumptions.

b. See attached table entitled "Compare MA-NY inputs (1-65)." The large majority of the differences observed there are due to the fact that the New York version of the model modified the definition of line density zones so that one density zone could be uniquely associated with clusters served by Manhattan wire centers. This leads to some density-zone-dependent input values that are unique to Manhattan, and to values shifting in other zones to align with the different zone definitions. Other differences in inputs are based on state-specific values in New York or Massachusetts. Some inputs were combined into a single input rather than broken down into component parts. Due to its voluminous nature, the attachment to this response is being provided in electronic format only.

c. Because state-specific models with all inputs entered into the inputs database were filed in both states, as opposed to entering state-specific inputs through the user interface provided with the model, there is no difference between the user input values and the default input values in either state.

d. There are no differences in technology assumptions per se, although the New York model forces all lines to be served by fiber optic feeder cable and digital loop carrier rather than allowing the model to make an economic choice between a fiber optic system and copper cable. This is accomplished through an input change that can be seen at line 147 in the table provided in response to part (b) for Massachusetts, the value in Cell B147 (and C147) is 9,000 feet, whereas for New York, the value in Cell I147 (and Cell J147) is zero.

e. There are no differences in platform algorithms.

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VZ-ATT 1-66: Does the HAI 5.2a differ from the HAI Model Release 5.2a that was filed by AT&T with the New Jersey Board of Public Utilities? If so, please identify any and all differences. The response should identify, but not necessarily be limited to, all:

a. differences in modeling assumptions;
b. differences in input assumptions;
c. differences and supporting justification for changes in default input assumptions;
d. differences in technology assumptions; and,
e. differences in platform algorithms.

Respondent: R. Mercer

RESPONSE: See objection in response to information request VZ-ATT 1-65.

SUPPLEMENTAL RESPONSE:

a. There are no differences in modeling assumptions.

b. Differences in inputs are based on state-specific values.

c. See attached table entitled "Compare MA-NJ inputs (1-66)." The changes are listed at pp. 49-50 of the Direct Testimony of Dr. Robert A. Mercer in Massachusetts, each referenced to a section of Exhibit RAM-3 (the HAI Model Inputs Portfolio), and the justification for each change is provided in the referenced section of Exhibit RAM-3. Due to its voluminous nature, the attachment to this response is being provided in electronic format only.

d. There are no differences in technology assumptions.

e. There are no differences in platform algorithms.

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VZ-ATT 1-67: On page 8, lines 5-6, of his Direct testimony, Dr. Mercer states that HAI 5.2 "neither is nor should it be a tool for designing a physical telecommunications network." Is it Dr. Mercer's position that TELRIC costs should not be based on the design of an actual physical telecommunications network? Please explain in detail.

Respondent: R. Mercer

RESPONSE: It is Dr. Mercer's position that ". . . HAI 5.2a-MA is a highly sophisticated costing tool capable of calculating the TELRIC costs of UNEs in Massachusetts." It ". . . is not a tool for designing a physical telecommunications network."

SUPPLEMENTAL RESPONSE: No. HAI 5.2a-MA *is* based on an actual telecommunications network, just not the one that Verizon has in place. Dr. Mercer's original response to this information request explains his position about the relationship between the process of estimating TELRIC costs using the HAI Model, and the network engineering processes Verizon may use to deploy portions of its network. The HAI Model configures a network, and calculates the amount, capacity, and location of the components of that network, in sufficient detail to allow it to determine the network's TELRIC-based costs. It does so in a manner consistent with TELRIC methodology. It does not purport to provide the detailed engineering guidelines and tools for the deployment and installation of the network and its components by Verizon personnel any more than does Verizon's cost model submitted in this proceeding.

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VZ-ATT 1-68: Identify any and all of the default values in the HAI 5.2a that have been changed from the Hatfield Model, Release 2.2.2 previously submitted by AT&T in Massachusetts. For each default value:

a. specifically explain the nature of each change;

b. set forth in detail the reasons for each change;

c. identify the person or persons responsible for determining each change;

d. provide copies of all documents that were considered in connection with each change or in any way discusses each change; and

e. provide a summary of communications regarding the decision to make each change.

Respondent: R. Mercer

RESPONSE: AT&T objects to this information request on the grounds that it is overbroad, unduly burdensome, irrelevant and not reasonably calculated to lead to the discovery of admissible evidence. HM 2.2.2 is not at issue in this proceeding. Nonetheless, because HM 2.2.2 was submitted to this Department in the 1996 *Consolidated Arbitration* docket, and subject to and without waiving its objections to this information request, AT&T states as follows:

a. The differences between HM 2.2.2 and HAI 5.2a-MA are so fundamental that a direct comparison of the inputs would be meaningless. Requiring AT&T to perform such a comparison would be both unreasonable and unduly burdensome. Attached hereto is a paper copy of a Hatfield Model Version 2.2.2 Inputs Summary; to the best of AT&T's knowledge, no electronic copy of this document still exists. Using the attached Summary and either the HAI 5.2 Inputs Portfolio ("HAI 5.2a-MA HIP"), or Appendix B of the HAI 5.2a-MA Model Description, Verizon-MA can compare the input values in the two versions of the Model.

b. See response to VZ-ATT 1-34.

c. No one person, or group of persons, was assigned the responsibility for changing a particular default input value. Such decisions were the result of innumerable conversations over a number of years, both in person and by telephone, by HAI and BroadView Telecommunications ("BVT") with a great number of persons both within the AT&T and MCI organizations, and independent outside sources. The best source of support for any default value in the HAI Model can be found in the HAI Inputs Portfolio ("HAI HIP"), which describes not only the support but also the justification for each default input value used in that version.

Again, without waiving its objections to this information request, AT&T states that the following individuals have played significant roles in the overall development of HAI Model inputs:

Dr. Robert A. Mercer, BroadView Telecommunications, LLC
Richard A. Chandler, HAI
Dr. A. Daniel Kelley, HAI
Michael R. Lieberman, AT&T
Dr. Mark T. Bryant, MCI
Members of the Engineering Team as identified in response to VZ-ATT 1-91.

d. The default values are estimates of HAI based on HAI expertise and the culmination of innumerable oral discussions that persons at HAI and BVT have had with equipment vendors and manufacturers, subject matter experts at CLEC and ILEC organizations, and with other consultants in the telecommunications field, and of examining available written documentation, such as that filed with the FCC, all of which have taken place over a number of years. Apart from the current HIP portfolio and the other documentation in the public record, including documents provided in response to VZ-ATT 1-80, there are no other workpapers or other written documentation generated in determining the default values in HAI 5.2a.

e. See response to part "d" above.

SUPPLEMENTAL RESPONSE:

a. The following list of changes is taken from copies of the HM Model Description for the respective versions of the Model:

SUMMARY OF CHANGES BETWEEN HM2.2.2 AND HM3.1

A number of significant changes have been made to HM2.2.2 in developing HM3 .1. These changes are reflected in the discussion of how the new version operates, presented in Section III. They can be summarized as follows:

? Results can be displayed by wire center, density zone, and/or CBG.

? Additional density zones are considered. The highest density zone defined in HM2.2.2, greater than 2,500 lines per square mile, has been split into three new zones: 2,550 - 5,000; 5,001 - 10,000; and more than 10,000 lines per square mile. This better differentiates between dense suburban and dense downtown areas. The second lowest density zone in HM2.2.2, 5- 200 lines per square mile, is also subdivided into two zones, 5-100 and 101-200 lines per square mile, thereby providing finer-grained distinctions within low-density areas.

? Within each loop density zone, loop component costs, distribution, concentration, feeder, and total loop costs are separately displayed for lines served by copper feeder and lines served by fiber-optics digital loop carrier (DLC) systems. The selection between these two technologies is based on the total length of feeder from the wire center to the Census Block Group ("CBG"), or cluster within a CBG, in question; this crossover threshold is user adjustable.

? Each CBG is now assigned to a wire center based on an analysis of NPA-NXXs serving that CBG. In previous versions of the model, CBGs were assigned to the wire center closest to its centroid. The revised method provides a more accurate determination of the existing wire center that actually serves lines in the given CBG.

? Methods of estimating the number of residence and business lines per CBG have been refined. These refinements, for example, now account for differences in the demand for business lines per employee based on characteristics of the industries that employ these workers, and differences in the demand for residence lines based on the age-income profile of the CBG.

? An improved, more precise, treatment of distribution cable numbers and lengths now better comports with the actual population distributions. The new treatment takes account of a variety of demographic situations. These include the presence of high rise residential/business buildings, multi-tenant units in high-density zones, and towns and unpopulated areas in low-density zones. A key facet of the revised treatment is that the number and length of cables are no longer fixed by density zone; rather, they are determined for each CBG based on that CBG's specific demographics.

? Distribution cable sizes of six and twelve pairs are added to the existing cable sizes.

? The level of cable fill achieved at the Main Distributing Frame (MDF) is reported in a manner that is consistent with the typical LEC definition of cable fills.

? Copper loops in excess of 18,000 feet use a coarser gauge of cable and include load coils as necessary. If they are connected to DLC remote terminals, a more expensive remote terminal channel unit is also assumed.

? The calculation of drop and Network Interface Device ("NID") costs has been refined by adding drop length components to the drop cost, allowing the drop to be aerial or buried (with appropriate costs for each), and specifying NIDs of varying capabilities.

? The switching system cost model is more sophisticated. It treats RBOCs and large independents separately from small independents, and considers required administrative fill on switch line cards.

? The interoffice transport network assumes the use of SONET fiber rings where appropriate, and treats transmission terminal investments in a more detailed manner. IXC entrance facility costs have been included.

? The calculation of structure sharing between feeder and interoffice cost plant has been refined.

? Depreciation expense calculations have been changed to reflect the use of mid-year investments and to adjust for net salvage value. Also, land has been removed from the depreciation calculation.

? Investments in buildings, motor vehicles, garage work equipment, and other work equipment have been added to the general support category.

? The costs of certain labor-intensive investments may now be adjusted by the user to reflect regional labor cost differences.

? The accuracy of several calculations has been improved, such as:

- multiple Serving Area Interfaces (SAIs) in a CBG are added when the number of lines served is too large for a single SAI;

- additional conduit is provided when additional copper feeder cables are required; and are required; and

- conduit is no longer shared among utilities, and spare conduit is underground added to distribution, feeder, and interoffice routes.

? A number of component cost inputs have been revised to reflect more accurate information than was available for HM2.2.2.

? The formats of numerous intermediate and final output reports have been improved.

? The model will now execute considerably faster, and on a PC with reduced memory.

? Inclusion of data for all telephone companies in 49 states (Alaska excluded) plus the District of Columbia;

? Correction of previous data error in assignment of CBGs to correct wire center quadrant;

? Clean up of transport, signaling and tandem switching calculations;

? Corrections to the default values of several of the user-adjustable inputs;

? Enhanced documentation;

? The ability to display all outputs (investments, monthly costs and USF support) by density zone, wire center and CBG.

As important as all of these changes are in increasing the accuracy and granularity of the model's results, it is also important to emphasize several aspects of HM2.2.2 that have been maintained in HM3.1. These include:

? Incorporation of economic principles that the Joint Board has identified as appropriate in estimating the cost of universal service;[1] namely,

- consideration of all costs associated with all elements necessary to provide universal service, including all major categories of network components (i.e., loop, switching, transport, signaling), and all detailed components within those categories (e.g., network interface devices, drops, terminals and splices, wire center components in addition to switching, interoffice terminals, etc.);

- assumption of least cost, most efficient and reasonable technology currently available to LECs;

- use of existing ILEC wire center locations that actually serve the customers in question;

- consideration of forward-looking costs only, not embedded or sunk costs;

- use of forward-looking cost of capital, and economic depreciation expenses;

- estimation of the cost of providing service to all business and households within a geographical area, including first and "second" residential lines, business lines, public access lines, and special access lines;

- a reasonable allocation of shared cost and variable overhead;

- availability of all data, computations, and software associated with the model to all parties for review; with the ability to examine and, at the user's option, modify over six hundred inputs;

? The estimation of costs related to a narrowband network capable of supporting universal service, as defined by the Joint Board, and to narrowband unbundled network elements; and

[1] These are also consistent with the TELRIC principles set forth in the Commission’s Interconnection Order pertaining to the pricing of unbundled network elements.

? The calculation of the cost of universal service, unbundled network elements, and network interconnection in a single model, using a consistent methodology and a consistent set of inputs.

SUMMARY OF CHANGES BETWEEN HM 3.1 AND HM 4.0

A number of significant changes have been made to HM 3.1 in developing HM 4.0. They can be summarized as follows:

Input Data and User Interface

? includes improved counts of lines served by certain small LECs based on data from the USF NOI (Universal Service Fund Notice of Inquiry Data Request from 1994); USTA (United States Telephone Association); and RUS (Rural Utilities Service);

? incorporates a more accurate list of wireline wire centers and associates CBGs with these wire centers more accurately;

? allows the user to input the fraction of reported private line and special access circuits that are DS-0, DS-1 and DS-3 facilities, to accommodate such data when available;

? contains more user-adjustable inputs, including effects of soil types on placement difficulty, cable placement activity factors, and others;

? allows the count of residence and business lines to be normalized to the counts reported by the ILEC for each wire center, to the extent that information is provided or available.

Distribution Module and Feeder Module

? changes the default impact of difficult soil conditions by increasing the cost of placement instead of increasing assumed route distances;

? explicitly accounts for various activities associated with the placement of outside plant, and provides user-adjustable inputs for the amount and cost of such activities;

? increases the cost of cable placement linearly as a function of bedrock depth rather than as a step function increase when the bedrock depth is less than the user threshold.

Distribution Module

? allows the user to set the percentage of customers located in population clusters on a CBG-by-CBG basis, or, alternatively, to use an overall percentage as in version 3.1.

? replaces the treatment of long loops using coarse-gauge cable and load coils to one using T1 technology to reach within 18,000 feet of each customer. This ensures that all customers can receive digital services at an ISDN Basic Rate Interface or faster digital data rate;

? provides a more sophisticated calculation of the investment in the Serving Area Interface (SAI) as a function of the number of lines served from the SAI;

? computes drop investment per location using detailed input demographic information for each CBG, and otherwise refines the calculation of drop costs;

? computes and displays the achieved distribution fill level at the SAI instead of at the branch cable;

? assumes the use of 26-gauge cable rather than 24-gauge cable for cable sizes of 400 pairs and larger, consistent with loop resistance design and the limitation of copper loop lengths to 18,000 feet.

Switching and Interoffice Module

? provides the user additional flexibility in specifying the switching cost by allowing both the "slope" term in the switching cost function and the constant term to be varied.

Expense Module

? allows the user to control via "toggles" the line categories (primary residence lines, secondary residence lines, single-line businesses, multi-line businesses, public) that are included in supported universal service;

? separates the economic lives and salvage values of the capital plant categories;

? includes general support and miscellaneous expenses in the calculation of carrier-to-carrier expenses;

? displays the versions of Distribution, Feeder, and Switching/Interoffice Modules used to compute investment;

? includes a more sophisticated universal service output sheet that displays significantly more detailed support results;

? provides sharing of manhole costs with other low-voltage users;

? explicitly accounts for the difference in business and residence dial equipment minutes (DEMs) in determining usage costs for Universal Service Fund calculations.

Several minor changes have also occurred in the model, its data and interface between the preliminary filing of HM 4.0 on July 14, 1997 and the current August 1, 1997 release of HM 4.0. These include:

? cleanup of lines data for some of the telcos;

? adjusted default values for buried drop placement costs and structure sharing;

? elimination of several incompatibilities in the operating interface;

? correction of the treatment of access costs for business lines in the Density Zone expense module USF sheet;

? cleanup of numerous calculations in the Wire Center expense module to ensure greater consistency with calculation methods in the Density Zone expense module.

SUMMARY OF CHANGES BETWEEN HM 4.0 AND HM 5.0a

The changes between HM 5.0 and the previous release of the model, HM 4.0, are summarized in the first portions of this section. Section 2.8 summarizes the changes between HM 5.0 and HM 5.0a.

<u>2.1. User Interface</u>

? The new features of the user interface provide the user with many additional inputs and options. Among the new inputs included are the ability to designate specific end office switches as hosts, remotes, or standalones – as well as to assign remotes to a particular host; ability to specify variable T1 repeater spacing; ability to enable the steering of feeder toward population clusters within a quadrant; the ability to invoke a wireless distribution option if its cost is less than wireline, and many more.

? The interface also now allows the user to select multiple companies from one or more states (limited only by hard drive space) to be run in automatic sequence by the model. Expense Modules and workfiles are then produced for each individual company, and their universal service calculations rolled up.

<u>2.2. Input Data</u>

? The HM 5.0a input data locate customers much more precisely. These data determine the actual precise locations of as many customers as possible through latitude and longitude geocoding of their addresses. The remainder are located to at least the Census Block ("CB") level of precision and are assumed to be placed along the CB's periphery.

? A clustering algorithm is used to determine groupings of customers that have extremely realistic correlation to efficient distribution areas.

? The August 1997 Local Exchange Routing Guide ("LERG") is used to identify and locate LEC wire centers.

? Business Location Research ("BLR") wire center boundaries are used to associate customer locations with LEC wire centers. This ensures that all identified clusters are restricted to include only customer locations that fall within the boundaries of a single wire center.

? Company line count totals are determined from the most recent available data, including that provided in the 1996 ARMIS data and NECA USF Loops filing for 1996.

? The method of estimating line counts by LEC wire center is refined, and line counts can be determined by CB.

? 1996 ARMIS data (rather than 1995 ARMIS data) are used to estimate traffic volumes and expense inputs.

2.3. Outside Plant Selection

? HM 5.0a automatically adjusts buried and aerial structure fractions to account for varying maintenance costs and placement costs occasioned by local soil conditions and bedrock. The amount of one type of structure substituted for another depends both on differences in placement costs and on a life-cycle analysis of maintenance and capital carrying costs of the two types of structure.

2.4. Distribution Module

? HM 5.0a lays its distribution plant directly over the actual identified locations of customer clusters.

? Rather than assuming that the distribution area is square, HM 5.0a engineers its distribution grid as a rectangle. The aspect ratio (height-to-width) of this rectangle is determined by the data input development process for each cluster, and distribution cable is laid out in a fashion that reflects this aspect ratio.

? HM 5.0a serves "outlier" clusters from "main clusters" on which they home, using digital T1 technology whenever the road cable length exceeds a user-adjustable maximum analog copper distance. The cables carrying T1 signals to the outlier clusters are separate from the analog copper cables that extend from the T1 terminal in each outlier cluster to the customer locations within the outlier cluster.

? Assuming that the distance of a cable run is sufficiently short so that use of copper feeder is a technically acceptable option, the HM 5.0a performs an analysis of the relative life-cycle costs of copper versus fiber feeder to determine which feeder technology should be used to serve the given main cluster.

? The HM 5.0a also incorporates an optional, user-adjustable "cap" on distribution investment. This cap is structured to reflect the potential cost structure of wireless distribution technologies.

2.5. Feeder Module

? HM 5.0a engineers feeder to serve actual population main clusters (and uses distribution cable to serve main clusters' subtending outlier clusters), rather than simply engineering to each CBG.

? At the user's option, the HM 5.0a "steers" feeder routes toward the preponderant location of main clusters within a given wire center quadrant. When this steering is invoked, the user may also apply an adjustable route-to-airline distance multiplier to the amounts of cable placed along these "steered" feeder routes.

? Manhole placement costs are increased by a user-specified amount whenever the local water table depth is less than the user-specified threshold.

2.6. Switching and Interoffice Module

? At the user's discretion, HM 5.0a will both engineer and cost explicit combinations of host, remote and stand-alone end office switches. If the user does not make such a specification, the HM 5.0a defaults to computing end office switching investments using input values that provide average per-line investments for an efficient portfolio of host, remote, and stand-alone switches. If the host/remote/standalone designation option is invoked, the user is required to specify whether a wire center houses switches that are hosts or remotes, as well as to assign the correspondence between host and remote switches.

? Further, when the user chooses the model to distinguish explicitly between switch types, the HM 5.0a assumes that each host and its remotes are on a Synchronous Optical Network ("SONET") fiber optics ring separate from the interoffice rings used to interconnect host, standalone and tandem switches with each other.

? The HM 5.0a calculates explicitly a set of interoffice SONET rings that interconnect host, standalone, and tandem switches with each other. Based on this explicit specification of what wire centers are on each interoffice ring, the HM 5.0a determines associated ring distances using the actual locations of the wire centers along the ring. In addition, the rings are appropriately interconnected with each other, and tandem switches are also interconnected if they fall within the same LATA.

? The HM 5.0a engineers redundant paths and associated transmission terminal equipment for the point-to-point (folded) rings that may be specified to connect small offices to the larger wire centers on which they home.

2.7. Expense Modules

? A Uniform System of Accounts ("USOA") detail worksheet is included that breaks out HM 5.0a investments and expenses by Part 32 account for comparison purposes.

? The proportion of total expenses that are assigned to loop network elements (i.e., NID, distribution, concentration and feeder) can be varied based either on relative number of lines, or on the relative amount of direct expenses (direct expenses include both maintenance expenses and capital carrying costs for the specific network elements).

? Both federal and state universal service fund requirements can be calculated in the density zone USF worksheet. This separate calculation permits differing state and federal cost benchmarks to be specified, as well as different collections of local services (e.g., primary and secondary residential lines, single business lines, etc.) to receive universal service support.

? In addition to displays of costs at the lines density zone and wire centers levels of aggregation, costs can also be displayed at the CBG and individual population cluster level.

2.8. Changes Incorporated in HM 5.0a

2.8.1. Distribution Module

? HM 5.0a modifies its method of dividing clusters to more efficiently ensure that the length of cables carrying analog signals never exceeds the user-set maximum (default = 18,000 ft).

? HM 5.0a corrects minor typographical errors in equations used to calculated the portions of structure that "swing" between buried and aerial based on abnormal local life-cycle costs, and in the wireless cap equations.

2.8.2. Switching and Interoffice Module

? The time required to execute this module for large companies is reduced by sourcing from other portions of the workbook, rather than calculating, certain distance and DS3 count information.

? For wire centers owned by small LECs without local tandems, connectivity to a tandem is established in two pieces. First, a spur is engineered to the closest large LEC wire center that is on an interoffice ring. Second, the equivalent investments in facilities and terminal equipment associated with the required number of leased circuits on this ring that are used to connect this large LEC wire center to its tandem are calculated on a per-DS0 facilities basis. This is in contrast to the previous method of engineering a separate interoffice route between the small LEC wire center and the large LEC tandem.

? Rings now must have a minimum of four nodes, assuming there are that many wire centers, versus a prior minimum of two nodes.

? HM 5.0a provides several new "traps" to prevent certain execution problems. These include: 1) the ring-generating code is modified to expect the user-specified "host/remote enable" option as boolean type rather than a string; 2) stand-alone tandems now have an associated interoffice distance; 3) the number of allowed wire center records has been increased from 1,500 to 2,000; 4) the ring-generating code contains logic to determine whether host/remote calculations are enabled before eliminating remotes as first order ring candidates; 5) the ring-generating code uses wire center records generated from the HM5.0a database as the source of the locations associated with a particular state and operating company; 6) the ring-generating code now updates the progress bar in closer proportion to the module's degree of completion; 7) the ring-generating code writes all results into a list in the "ring io" worksheet; 8) the array dimension in the routine computing interoffice mesh distances has been increased from 25 to 100 elements; and 9) several additional "divide checks" are provided and syntax errors corrected.

2.8.3. Expense Modules

2.8.3.1. Density Zone and Wire Center Versions

? Corrects the calculation of weighted average depreciation life for non-metallic cable to include interoffice fiber facilities.

? The "Cost detail" sheet of the DZ version allows for the substitution of ICO-equivalent DS0 transport values.

? Corrects cell references for residential and business usage in the wire center USF sheet from absolute to relative.

2.8.3.2. Expense Modules – CBG and Cluster Versions

? Improves on the previous CBG expense module by associating cluster costs to the several CBGs that may overlay the cluster in proportion to the relative number of lines that each CBG displaces of the cluster's total quantity of lines.

? Adds a Cluster expense module that displays cost results on a customer cluster-by-cluster basis.

2.8.4. Interface Items

? Corrects several non-functioning items in the interface, including: 1) permitting Puerto Rico to be run through the interface; 2) fixing the OLE error that previously has occurred the initial time the newly installed HM 5.0 is run; and 3) speeding the run time of the Feeder module.

2.8.5. Input Data Items

? Corrects several data discrepancies, including: 1) correcting the several "problem clusters" that previously were incorrectly sized; 2) adding the clusters that were missing from the California data; and 3) assigning correctly the lines density classification of Puerto Rico clusters; and 4) correcting the state assignment of several small LECs that operate across state borders.

? Adds CBGMulti data table that relates clusters to the several CBGs that overlay them based on relative counts of lines associated with each CBG.

SUMMARY OF CHANGES BETWEEN HM 5.0A AND HM 5.2A-MA

This section summarizes the changes between HM 5.2a-MA and the release of the Model that was filed with the FCC in January 1998, HM 5.0a.

1.2.1. User Interface

? Includes several new inputs to the user interface that reflect new capabilities that HM 5.2a-MA provides to the user.

? Reflects changes in the default values of some existing inputs resulting from the availability of new information, the results of regulatory proceedings, and/or further consideration by the developers of the HAI Model.

? Allows for a more efficient implementation of host-remote relationships by including an access table input of existing host-remote relationships from the LERG, which the user can modify if appropriate through the interactive mode for entering such relationships that was introduced in HM 5.0a, rather than starting from scratch to make such entries.

1.2.2. Database

? For customer locations in a census block ("CB") that are not geocoded, surrogate locations are uniformly distributed along the roads in the CB, rather than along boundaries of the CB as in HM 5.0a.

? Locations, area, and aspect ratios of rectangles representing customer location clusters more accurately reflect the actual shape of those clusters by eliminating the requirement that the rectangle's axes be aligned in a north-south, east-west orientation.

? Includes strand distance in the data record for each main cluster to represent the amount of cable that is theoretically required to connect locations within a main cluster and its associated outlier clusters.

1.2.3. Distribution Module

? Allows the user the option to "normalize" the computed total distribution route distance to the strand distance in each cluster. The user can also specify a multiplier to be applied to the strand distance separately in each density zone before performing this normalization, or can allow the Model to use a built-in strand distance multiplier calculation.

? When the user does not invoke the strand distance normalization option, ensures the Model produces enough distribution route distance to reach the corners of the cluster rectangles where customers may be located.

? Eliminates the potential for double counting drop structure for multi-dwelling buildings such as duplexes and four-plexes.

? Distinguishes between aerial cable on poles and block/building cable by allowing the user to specify the amount of cable that is actually building/block cable.

- ? Includes poles for aerial cable in all density zones.

- ? Alters investment in high-density and low-density digital loop carrier ("DLC") channel units when the maximum copper distribution cable distance exceeds a user adjustable input threshold.

- ? Corrects the calculation that adds remote terminals ("RTs") in outlier clusters in the Calculations worksheet to use subscriber road cable distance instead of T1 road cable distance, and also corrects the RT investment calculations in cases where there is more than one RT in a given customer cluster.

- ? Includes new copper cable sizing inputs that do not vary with density zone, in keeping with "fill factor" inputs recently being prescribed by various state commissions and in recognition of the fact that modularity in cable size leads to effective fill factors that can be significantly less than the corresponding input values.

- ? Adopts investment for SAIs based on the result of an FCC examination of both indoor and outdoor SAIs

<u>1.2.4. Feeder Module</u>

- ? Computes the weighted average structure sharing fraction for each of the six structure sharing inputs (i.e., three types of structure – aerial, buried, and underground – each for distribution and feeder cable) for each wire center based on the actual mix of density zones to which clusters in the wire center belong.

<u>1.2.5. Switching and Interoffice Module</u>

- ? Allows the user to specify percentages of various traffic types by switch size: percentage of total traffic that is interoffice; percentage of total traffic that is operator-assisted; percentage of local traffic that is direct-routed; percentage of intraLATA traffic that is tandem-routed; and percentage of interLATA traffic that is tandem-routed. This capability permits the user to specify different traffic patterns that may exist in areas where different switch sizes are typically used, such as a different breakdown between intra-switch and inter-switch traffic in rural, suburban and urban areas.

- ? Incorporates the investment values for Bell Operating Company ("BOC") and ICO switches adopted by the FCC in the USF Inputs Order.

- ? Properly applies the analog line circuit offset for DLC lines to switched lines only.

? Decreases the investment in interoffice terminals in small wire centers that are connected to high-capacity (multiple OC-48) rings.

? Adds sufficient digital cross connect systems to ensure logical rings comprising a physical ring can be fully interconnected.

? Adds sufficient OC-3 multiplexers to ensure the interconnection of circuits between different physical rings, and between the ring "systems" that comprise the rings connecting wire centers served by a given tandem switch, can be done at a DS-1 level of granularity.

? Calculates required tandem capacity and investment on a LATA-by-LATA basis, rather than for the study area as a whole.

? Substantially reduces run time through the use of more efficient ring-generating code.

? Allows the user to specify the facilities-equivalent investment for leased facilities in an "a+bx" form, where the "a" term is a fixed amount and the "b" term a per-mile amount.

1.2.6. Expense Modules

? Includes modifications to the USOA Detail worksheet to account for deferred taxes resulting from Internal Revenue Service ("IRS") treatment of depreciation.

? Wire Center Expense Module contains new columns in the Investment Inputs worksheet to accommodate weighted average structure sharing percentages for each structure category.

? Density Zone Expense Module includes new cells in the Input worksheet for residential and business Dial Equipment Minutes ("DEMs") per line in order to make output columns available in the Switching/Interoffice Module for reporting weighted average structure fractions and A-line totals per wire center.

? Density Zone Expense Module includes adjusted operator wages calculation to reflect monthly wages and updated (1996) input operator wages.

? Density Zone Expense Module produces state-wide results for UNEs in the form specified by Verizon. This is done through the addition of a new worksheet labeled "Rate Summary."

? Allows the user to enter an expense to investment (E/I) ratio for each plant category in the ARMIS 99 Actuals worksheet of an Expense Module. When set, the user-defined ratio will override the module's default calculation of the E/I ratio based on the ARMIS expense and investment information. In HM 5.2a-MA, the worksheet is pre-coded with the ratios specified by the FCC in its USF Inputs Order.

? Applies the Network Interface Device ("NID") yearly operations expense to the total number of lines.

1.2.7. Distance File

? Adds information on LATAs and tandem counts necessary to allow the Switching and Interoffice Module to calculate tandem capacity and investment in each LATA individually.

? With certain restrictions, homes ICO wire centers on the nearest tandem switch, regardless of the ownership of the tandem. BOC wire centers continue to be homed on a tandem owned by the BOC.

? For a set of wire centers belonging to a given ICO that home on a particular tandem, the ring code designates the wire center in the set that is located closest to the tandem to be the "gateway" wire center for the set. The gateway wire center serves to connect the tandem and all remaining wire centers in the set.

b. The reason for changes in the respective versions of the HAI Model is explained in the original and supplemental response to Information Request VZ-ATT 1-34.

c. See original response to part "c" of this request.

d. It is impossible to recreate or recompile the documents that AT&T, HAI and the many consultants and subject matter experts consulted by HAI used to develop and support inputs in the various versions of the HAI Model.

AT&T noted in its original response to this Information Request that it believed it had either provided all relevant documents or such documents were part of the public record. However, there are a number of documents that were used to support inputs in previous versions of the Model that have been filed in other proceedings. In the Supplemental Response to Information Request VZ-ATT 1-80, AT&T expects to provide those documents. As will be noted in the Supplemental Response to VZ-ATT 1-80, because so many documents have been reviewed by so many people over so many years, it is possible that some documents identified in the HAI Model HIPs may be inadvertently omitted. Such an omission is not intentional and if Verizon-MA will point out any instances where this appears to be the case, AT&T will attempt to provide the omitted document or documents.