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OFFICE OF THE SECRETARY

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

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

**AFFIDAVIT OF**
**Robert Clinesmith**

I, Robert Clinesmith, being duly sworn, say:

## INTRODUCTION & SUMMARY

1. My name is Robert Clinesmith. I am a Staff Manager – Cost Models and Methods at GTE.

2. I received a Master's of Science degree in Land Development in 1986 from Texas A & M University and a MBA in Finance from the University of Texas at Arlington in 1988.

3. From November 1989 to February 1995, I worked in corporate finance for Texas-New Mexico Power Company performing strategic and tactical analysis using statistical and financial models.

4. In February 1995, I accepted a position as a contractor with Akili Systems as a contract programmer-analyst for MCI Telecommunications ("MCI") performing

marketing analysis and call center capacity research for MCI's Mass Markets National Resource Management Group. In January of 1996, I became manager of Call Planning for MCI and was responsible for capacity planning, staffing analysis, call routing recommendations and call volume forecasting for 25 market segments flowing into 15 call centers. From November 1996 to April 1998, I was Chief of Staff of MCI Southwest Region Field Operations. In this position, I managed a wide variety of issues relating to the dispatch, switching, transport and systems supporting the provisioning and maintenance of circuits.

5. In my current position with GTE, I am responsible for the development of systems and procedures necessary to support validation of GTE's Integrated Cost Model.

6. Following release of the so called synthesized cost model platform adopted by the FCC on October 28, 1998 in its Fifth Report and Order ("FCC Model" or "Model"),[1] GTE undertook an effort to review, analyze, understand and validate the Model's operation and results.

7. Before the FCC Model can be analyzed, it must first be assembled. GTE acquired the HCPM Module on the FCC's web page on November 18, 1998. Since no real cluster data or geocoded data was available from the FCC for the

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1/ In the Matter of Federal State Board On Universal Service; In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LEC's, CC Docket Nos. 96-45, 97-160, *Fifth Report & Order*, FCC 98-279 (rel. Oct. 28, 1998) (the "Order").

analysis, GTE had to acquire clustered data for a test state (GTE-PA) from PNR & Associates, Inc. ("PNR").

8. The purpose of this affidavit is to detail the experience GTE has had with the data PNR provided to operate the FCC Model.

## THE FCC MODEL'S USE OF PNR DATA PRECLUDES A MEANINGFUL EVALUATION

9. The PNR data necessary to run the FCC Model is costly, and is delivered in a format that precludes its validation. This data for the PA FCC Model run cost GTE $15,000. A copy of the PNR invoice is appended hereto as Exhibit 1. The data PNR delivered on November 4, 1998 was provided in a clustered binary file "bin" format. While this data was usable for running the FCC Model's Loop module, its format precluded GTE from modifying the data or assumptions input into the clustering and customer location module. Furthermore, only after obtaining the data in a disaggregated customer location input (*.in) file format can a complete and meaningful analysis of the clustering and customer location module be made. To date, PNR has refused to produce the requested data in this format citing proprietary concerns.

10. GTE's inability to review or analyze the PNR data is compounded by the limited documentation PNR provided describing the treatment of the data and how the files were created.

11. Each change to the FCC Model requires that updated intermediate files be obtained from PNR. This could be minimized if the PNR data were provided in the disaggregated input (*.in) file format. GTE is thereby precluded from evaluating the methodology or parameters used in the location of it's customers in the FCC Model.

## CONCLUSION

1. The PNR data neccessary to operate the FCC Model is costly, insusceptible to analysis, and otherwise not available to the interested public. For these reasons, it precludes GTE from a completing a thorough and meaningful analysis of the FCC Model.

I hereby swear, under penalty of perjury, that the foregoing is true and correct.

Robert Clinesmith

Subscribed and sworn to before me this 17th day of December, 1998.

Retha Collins

Notary Public

My Commission Expires: Sept. 9, 2002

RETHA COLLINS
NOTARY PUBLIC
State of Texas
Comm. Exp. 09-09-2002

PNR

# INVOICE

**INVOICE NO: 981110-01**

**DATE: November 10, 1998**

**To:** Mr. Jerry Harris
GTE
600 Hidden Ridge
HQ EO2E65
PO Box 152092
Irving TX 75015

| QUANTITY | DESCRIPTION | UNIT PRICE | AMOUN |
|---|---|---|---|
| | PNR Custom data for HCPM Validation<br><br>(PA Data for R. Clinesmith) | | $15,000 |
| | | SUBTOTAL | $15,000 |
| | | SALES TAX | |
| | | SHIPPING & HANDLING | |
| | | **TOTAL DUE** | **$15,000** |

Make all checks payable to: PNR and Associates
Mail to: PNR and Associates / Indetec International
445 Marine View Ave., Suite 310
Del Mar, CA 92014
If you have any questions concerning this invoice, call: Kevin Landis (215)886-9200

**THANK YOU FOR YOUR BUSINESS!**

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**AFFIDAVIT OF**
**Jason Zhang**

I, Jason Zhang, being duly sworn, say:

## INTRODUCTION & SUMMARY

1. My name is Jason Zhang. I am a Staff Manager - Cost Models and Methods at GTE.

2. I received a Master's degree in 1994 and a Ph.D. in 1997 in Economics, both from Boston University. I have also completed three years of graduate study in Statistics. My areas of specialization are telecommunications economics, applied game theory, and industrial organization. My Ph.D. thesis focused on issues of costing, pricing, competition and regulation in the cellular telephone industry.

3. Over the last five years, I have been working in the development, analysis and application of telecommunications cost models. In particular, I have analyzed extensively various versions of the HAI Model (previously called the Hatfield

Model) and the Benchmark Cost Proxy Model ("BCPM"). More recently, I have analyzed the Hybrid Cost Proxy Model ("HCPM"), and have attempted to analyze certain aspects of the synthesized cost proxy model platform adopted by the FCC on October 28, 1998 in its Fifth Report and Order ("FCC Model").[1]

4. The purpose of my analysis of the FCC Model was to determine how the various model components interact and whether the Model is operating correctly. I attempted to review the FCC Model algorithms, to trace them between the various modules, and to verify whether data was processed properly within the Model.

5. Unfortunately, because of its incomplete and ever-changing nature, the FCC Model is not capable of a full and complete evaluation. Only certain components of the Model have been made available on the FCC's web page. These components have undergone continual revisions since their initial release on October 28, 1998.

6. To analyze the FCC Model, GTE used the HCPM Module from the FCC's web page on November 18, 1998. GTE had to acquire the missing components from other sources. The HAI Model components were taken from a HAI version based on our best understanding of the Order. Since no actual cluster data or geocoded data was available from the FCC for the analysis,[2] GTE also had to

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[1]In the Matter of Federal State Board On Universal Service; In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LEC's, CC Docket Nos. 96-45, 97-160, *Fifth Report & Order*, FCC 98-279 (rel. Oct. 28, 1998) (the "Order").
[2]The FCC did make available fictitious data for the State of Maryland.

purchase clustered data for a test state (GTE-PA) from PNR & Associates, Inc. ("PNR"). A description of the problems associated with the data provided by PNR is detailed in the Affidavit of Robert Clinesmith. Even with the assembly of the various modules, the FCC Model was still not capable of producing results using clustered data without one additional file (hcpmhm.ini) from PNR.

7. GTE has monitored the FCC Web site daily to keep up with the many modifications the Commission Staff has made to the FCC Model since the release of the Order. On December 17, 1998, the FCC posted yet another updated version of the Model on the FCC web site. Due to the late release of this most recent version, I was not able to evaluate it for purposes of this affidavit. To my knowledge the web site version of the FCC Model is still incomplete and inoperable.

8. Even though my review of the FCC Model was limited by the fact that the Model is incomplete and that geocoded data could not be procured for analyzing the clustering algorithm in the Model, I have uncovered convincing evidence that the Model contains very serious methodological and structural problems. These problems, as I will explain in more detail below, include:

- Different components of the FCC Model are not consistent with each other, leading to erroneous results.

- Switching investments do not take into account different technologies, leading to the averaging of costs between wire centers. This approach could further lead to cross subsidies across carriers, study areas and states.
- Changing some input values to the FCC Model leads to apparently erroneous changes in the Model's output. These changes include Water factor, SoilTexFactor, and Distance Type/Feeder and Distribution Road Factors.
- The FCC Model exhibits inexplicable sensitivity to some minor input format changes. For instance, altering the number of digits after the decimal point for some input variables causes the Model to freeze.
- The use of density, as defined by the FCC Model, will make input preparation for the density-indexed tables almost impossible to achieve.

9. It is impossible at this time to identify the source and scope of these modeling errors because the FCC Model is incomplete, constantly being revised, has incomplete documentation, is internally inconsistent, is missing a tracking option in its code to permit the user to follow the code and understand how the variables are being used, and has no customer location input data base.

## THE FCC MODEL IS REPLETE WITH SERIOUS PLATFORM ERRORS

### Inconsistencies between Modules

10. The FCC Model is derived from the cobbling together of certain distinct components of several different models, and as such is not a logical outgrowth of

any one of these prior models, but a unique platform. These prior models were designed based on a unique set of assumptions, rules, and interpretations of the Telecommunications Act of 1996. Because the Commission cobbled together modules from different models -- creating a unique new one -- the primary issue is whether the new model exhibits internal consistency. This is similar to assembling a new car from components of cars produced by different manufacturers. Since the individual parts are not interchangeable, the car will not work if the component parts are not modified to conform to the new car design. In melding various modules to form the new FCC Model, internal consistencies seem to have been ignored.

11. For example, the FCC Model uses Annual Charge Factors ("ACFs") inconsistently in its HCPM Module and in its HAI Expense Module. As indicated in the HCPM Module documentation, the ACFs in the HCPM Module consist of both capital expenses and operating expenses. Capital expenses and operating expenses are affected by factors such as capital structures, depreciation lives, salvage values and operating conditions. Any changes to those factors should affect the ACFs in the HCPM Module (and thereby affect the investment results from the FCC Model) because of the role of the ACFs in the loop optimization routine. These factors are included in the FCC Model's HAI Expense Module as user adjustable inputs. Altering the input values in the HAI Expense Module, however, does not cause the expected changes in the FCC Model output because there is no consistency or link between the HCPM Module and the HAI

Expense Module. As a result, changes in factors in its HAI Expense Module do not flow through to its HCPM Module to affect the expected changes in the Model outputs.

12. To establish this, I reduced the depreciation lives for fiber (aerial, buried and underground) by fifty percent of the default values in the HAI Expense Module with the expectation that the FCC Model would produce relatively more copper cable but less fiber cable investments. However, for the reasons explained above, the FCC Model does not produce any changes in the fiber and copper investments.

13. Another example of Model inconsistency is evident from the way the FCC Model handles structure-sharing impacts. The HCPM Model and the HAI Model each has a different structure-sharing algorithm. To maintain the internal consistency of the FCC Model, only one structure sharing algorithm should be used. Simply cobbling together modules from the HCPM Model and the HAI Model without disabling one of the two sharing algorithms or even documenting what is done, prevents the FCC Model from achieving internal consistency. This inconsistency causes the FCC Model to double count structure sharing savings and thereby produce artificially low cost estimates.

14. The presence of these and other inconsistencies among various modules in the FCC Model cause it to produce erroneous and meaningless cost estimates. Because of this problem, review of the Model using the Model results is meaningless.

## Switching Module Issues

15. The FCC Model's Switching Module estimates costs based on equations of the form: A + B * # Lines, in which A is a fixed investment and B is a per line investment for a switch. Because the FCC Model does not allow the specification of switching technologies, this approach is fundamentally flawed.

16. The fixed investments and per line investments for different switching technologies are expected to differ, due to differences in technology, market segment choice, or pricing strategy. For example, a 5ESS switch tends to have higher fixed investment but lower per line investment than a comparable DMS100 switch.

17. By failing to account for switching technologies in the Switching Module, the FCC Model can only produce an average switch cost from all technologies. By definition, the averaging of switch costs means some switching investments for some technologies will be understated, while those for some other technologies will be overstated. This methodology is flawed because it permits the cross subsidy of wire centers. Even worse, if this approach is used regardless of carriers, study areas or states, it even permits cross subsidies across carriers, study areas and states.

## Apparently Erroneous Model Results

18. Changes in certain inputs to the FCC Model lead to erroneous results. Those erroneous results suggest that the FCC Model may contain serious

methodological and structural problems. These inputs include the Water factor and SoilTexFactor as well as the Distance Type/Feeder and Distribution Road Factors. All these inputs are located in the feeddist tab of HCPM_inp.xls.

19. The Water factor and SoilTexFactor should capture the increased costs associated with placing telephone plant in areas where water or difficult soil conditions are encountered. A decrease in the value of the Water factor input should produce a decrease in the extra costs incurred when water is encountered in placing telephone plant. When the FCC Model is run with the Water factor input value changed from the default of 1.3 to 1, surprisingly there is no effect on the Model output. Similarly, a reduction of the SoilTexFactor should produce lower cost estimates because it decreases the extra costs incurred when difficult soil conditions are encountered in placing telephone plant. But changing the SoilTexFactor default value of 1.2 to 1 does not produce any change in the Model output. These erroneous outcomes indicate either that the factors are never used or there are code errors in the FCC Model.

20. The Distance Type and Road Factor inputs cause the length of cable routes used to connect any two points to be longer than the straight-line distance between them, thereby accounting for the fact that cable routes in the real world cannot follow straight-line routes between nodes in the network. The use of road factors will cause the route distance to increase by the value of the road factors relative to the straight-line distance. The use of rectilinear distance will increase the route distance between the points to varying degrees depending on location

of the rectangle en route. The limited Model documentation does not show exactly how various types of distances are used.

21. To account for additional cable route distances that may be needed, one can use rectilinear distance with all road factors set to 1 as used in the default inputs provided by the FCC. One can also use the feeder and distribution road factors along with straight-line distance type to achieve the same objective. Comparable input values specified for these two approaches should lead to comparable model outputs.

22. To test this relationship, I prepared comparable inputs for the two approaches such that both sets of inputs will cause cable route distances to increase to a similar degree. Use of rectilinear distance can cause the route distance between two points to be as much as 1.414, or (SQRT(2)), times the straight-line distance, depending on the location of the rectangle en route. However, the average ratio of rectilinear distance to straight-line is estimated to be about 1.285[3]. Since setting road factors for both feeder and distribution to 1.285 will cause cable route distance to increase to 1.285 times the straight-line distance, the road factors of 1.285 are on average comparable to the use of rectilinear distance in the FCC Model. But as shown below, the use of road factors have considerably higher impact in cost than the use of rectilinear distance in the FCC Model. To be conservative, in the FCC Model runs that I conducted, I set the

[3]The average ratio can be calculated as follows: $\int_0^1 [x + \mathrm{SQRT}(1 - x^2)]\, dx = (\frac{1}{2} + \frac{1}{4} * \pi)$.

road factors to be only 1.15, significantly lower than the 1.285 that I could have used.

23. I conducted FCC Model runs under the three different scenarios described in the table below:

| # Scenario | One | Two | Three |
|---|---|---|---|
| **Distance Type** | Straight Line | Straight Line | Rectilinear |
| **Road Factors** | 1 | 1.15 | 1 |
| **Cost Delta (from Scenario One)** | NA | 15% | 3% |

24. As indicated in the table, Scenario one uses straight-line distance with road factors set to 1. This scenario is used as the benchmark from which the other two scenarios will be compared. Scenario two increases the road factors in Scenario one from 1 to 1.15. As we can see from the table, this change leads to an increase of 15% in the cost per line from the FCC Model. In Scenario three, I changed the Distance Type from the straight line in Scenario one to rectilinear. As explained before, this should lead to a cost increase similar to that in Scenario two. Inexplicably, however, the FCC Model produces only a negligible increase in costs from Scenario three of about 3%, far less than the 15% produced under Scenario two. The 3% impact would be even less if I had used 1.285 as the road factor. Such large discrepancies in the cost impact from two comparable changes in the inputs point to serious errors in the FCC Model.

The logic and codes of the FCC Model must be examined in more detail to determine the full scope and source of these errors.

### Inexplicable Model Sensitivity

25. The FCC Model seems to be sensitive to how the inputs are specified. Even very minor changes to some input values, such as more digits after the decimal point in the default, produces an error message and freezes the FCC Model. For example, when I added more decimal points in the Normal structure input table, the FCC Model ceases to process and instead produces an error message "Error---Runtime error 106 at 000D:10CC". With incomplete Model documentation available and internally inconsistent modules, it is very difficult to determine why these input changes cause the FCC Model to crash.

### Density Issues

26. The FCC Model calculates line densities based on reduced areas that are defined by the convex hull of cluster boundaries. The use of the reduced area and of large clusters tends to concentrate clusters in a middle pack of density distribution compared to other cost models. Without appropriate documentation, the density-based inputs can be misapplied and comparison with other models can be misleading. For example, some of the default values of the FCC Model's HCPM modules contain density-based inputs that seem to have been borrowed from either HAI or BCPM without taking into account that the density is not

defined the same way between those models. The density as defined by the FCC Model makes it almost impossible to prepare density-indexed inputs, such as fill factors and structure costs required for the Model because there are no actual data available based upon reduced areas or densities as defined.

## CONCLUSION

27. The FCC Model is incomplete and to a large extent is still a black box. Even a limited review reveals that the FCC Model suffers from several methodological and structural errors. Until more analysis can be performed, the full scope of the errors cannot be determined and the FCC Model cannot be used as the platform to properly estimate the universal service cost for any company.

I hereby swear, under penalty of perjury, that the foregoing is true and correct.

Jason Zhang

Jason Zhang

Subscribed and sworn to before me this 17 day of December, 1998.

ALICIA M. DORSEY
MY COMMISSION EXPIRES
September 28, 2001

Alicia M Dorsey

Notary Public

My Commission Expires: September 28, 2001

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**AFFIDAVIT OF**
**Subhendu Roy**

I, Subhendu Roy, being duly sworn, say:

## INTRODUCTION & SUMMARY

1. My name is Subhendu Roy. I am a Staff Administrator- Cost Models and Methods at GTE.

2. I received a Master's degree in Physics in 1973 from the University of Delhi, India, a Master's degree in Economics in 1989 from the University of Wales, U.K. and a Ph.D. in Economics in 1997 from the Boston University. My areas of specialization are telecommunication economics, industrial organization, international economics and environmental economics.

3. Over the past two years, I have worked in the development, analysis and application of telecommunications cost models. In particular, I have analyzed extensively the cost studies for telecommunication services and elements, including various versions of the HAI Model (previously called the Hatfield Model), and the Benchmark Cost Proxy Model ("BCPM"). More recently, I have

analyzed the Hybrid Cost Proxy Model ("HCPM") and have attempted to analyze certain aspects of the so-called synthesized cost proxy model platform adopted by the FCC on October 28, 1998 in its Fifth Report and Order ("FCC Model" or "Model").[1]

4. The purpose of my analysis of the FCC Model was to determine whether the methodology underlying the Density Zone and Wire Center expense modules was accurate and whether the Model was operating correctly. I reviewed FCC model algorithms, traced them between the various expense modules, and attempted to verify whether data was processed properly within the Model.

5. Unfortunately, because of its incomplete and ever-changing nature, the FCC Model can not be fully evaluated. Notwithstanding the Commission's claim that a working version of the Model is available from the FCC web page, the Model's expense modules are nowhere to be found. I had to obtain separately the appropriate Density Zone and Wire Center expense modules of the Model from other sources.

6. GTE has monitored the FCC Web site daily to keep up with the many modifications the Commission Staff has made to the FCC Model since its release to the public on October 28, 1998. On December 17, 1998, the FCC posted yet another updated version of the Model on the FCC web site. Due to the late release of this most recent version, I was not able to evaluate it for

[1]In the Matter of Federal State Board On Universal Service, In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LEC's, CC Docket Nos. 96-45, 97-160, Fifth Report & Order, FCC 98-279 (rel. Oct. 28, 1998) (the "Order").

purposes of this affidavit. To my knowledge the web site version of the FCC Model is still incomplete and inoperable.

7. Even though my review of the FCC Model's expense modules was limited by the fact that the Model is incomplete, I have discovered very serious methodological errors, inconsistencies, and other problems. It is impossible to identify the source or scope of these modeling errors because the FCC Model has incomplete documentation, and has no customer location input data base. It appears, however, that the errors have the effect of both decreasing and increasing costs.

8. In both the Density Zone and Wire Center expense modules a number of methodological problems exist. The 'Per line' capability included in both expense modules appears to be incomplete since no choice between the 'Per line' method and the investment based method for calculating expenses has been incorporated.

9. The procedure used for taking net salvage into account during cost calculations in both expense modules is also flawed. For some unstated reason, both expense modules calculate other taxes based only on costs less overhead and customer costs, and not on <u>all</u> costs. Nor do the expense modules allow for taxes that are based on investment or permit any input for marketing expenses. Finally, the structure sharing calculations are performed twice in the FCC Model: once in the HCPM module and then again in the expense modules, thus doubly lowering the structure costs.

10. I have found a number of inconsistencies in the formulae of each expense module as well as between the two expense modules. These formulae errors relate to the expense to investment factor for the serving area interface and underground feeder placement, lives for main distribution frame ("MDF") protector, drop, and terminal, general support allocators, and local signaling costs. Since the logic involved in these formulae are not well documented, the inconsistencies can not be explained.

11. Finally, a number of formulae errors exist in the Wire Center module and the Density Zone module that cause the FCC Model to over allocate feeder underground costs and distribution underground trenching costs, and incorrectly calculate composite non-metallic cable life and end office ("EO") Wire center land costs.

## METHODOLOGICAL ERRORS

**Per Line Expenses**

12. In the Density Zone and the Wire Center modules, expenses for all network elements and support and overheads can be entered on a per line basis in the Worksheet "Per Line." However the manner in which these changes actually work through the module to produce the costs may lead to problems as described below.

13. In the Density Zone module the per line network expenses for those network elements that are part of the loop are added to the support & overhead

expenses. For the remaining Unbundled Network Element ("UNE") these are added to their direct expenses. The per loop support & overhead expenses are tagged on to the network interface device ("NID") per loop expenses. For all the above expenses, a method of calculating expenses from the Model investment using the ratio of expenses to investment also exists. There does not seem to be a choice between the per loop method and the investment based method for calculating expenses. Since all the expenses are added to get the total cost, double counting will result unless an algorithm is employed to enable the above mentioned choice.

14. In the Wire Center module the basic procedure followed is generally the same as in the Density Zone module. However, in this case the per line cost is added to the cost of each network element after all other costs, (i.e., capital cost, network expenses and support & overhead costs) are added together. Since network expenses based on investments are also present in these total costs, it may result in double counting unless a disabling algorithm is added.

**Annual Charge Factor**

15. The FCC Model's annual charge factor ("ACF") calculation is flawed because of the way net salvage is taken into account. The FCC Model uses net salvage to adjust the economic lives when selecting the appropriate ACF. There is no way to correct this flaw because it is hard coded in the FCC Model. The ACF (CCCFactor) consists of two parts, the depreciation factor (DeprecFact) and the

tax grossed up rate of return factor (GrUpRORFact). For the depreciation factor the procedure followed, although flawed, will produce the correct factor when straight line depreciation is used, because the error gets canceled in the process of levelization. However, for the rate of return factor, the methodology flaw produces an incorrect factor. The following example illustrates the error:

| **DeprecLife** | **8 Years (20% Salvage)** | **10 Years (0% Salvage)** |
|---|---|---|
| **CCCFact** | 0.19293 | 0.18265 |
| **DeprecFact** | 0.10023 | 0.10023 |
| **GrUpRORFact** | 0.09270 | 0.08242 |

16. In this example we consider an investment that has an economic life of 8 years and a net salvage of 20% at the end of its economic life using straight line depreciation. The first column contains the factors that would be produced by the correct procedure while the second column contains the factors that the FCC Model produces.

17. In the depreciation factor calculation, the correct procedure would require that for each $1 of investment, $0.1 per year [=$1*(1 - net salvage)/life] be set aside for depreciation purposes so as to get back the cost of all unrecoverable investment at the end of 8 years. The FCC Model instead calculates an adjusted economic life of 10 years [=life/(1 -net salvage)] that includes the effect of net salvage. For depreciation purposes, the FCC Model uses this adjusted economic life and

assumes 0% net salvage with that adjusted life. In the process, the FCC Model also sets aside $0.1 per year [=$1/adjusted life] for depreciation. Both procedures recover the full investment, the difference being while the correct procedure provides for recovery over 8 years, the FCC Model provides for recovery over 10 years.

18. If the timing of recovery were not of concern, the two procedures would yield identical results. However, the timing of recovery is taken into account while calculating the depreciation charge factor by first calculating the net present value ("NPV") of the annual depreciation set asides and then levelizing the NPV using a levelizing factor. Because of the differences in timing, the NPV in the two procedures would be different. Despite this, the depreciation factor calculated by both procedures is identical (=0.10023) since in the case of straight line depreciation where equal amounts are set aside each year, the NPV factor and the levelization factor cancel each other. This would not be the case for a depreciation procedure that provides for unequal amounts over the years (e.g., accelerated depreciation). Under such a scenario, the NPV factor and the levelization factor would not cancel each other, and the depreciation factor produced by the correct procedure would not be the same as that produced by the model.

19. A comparison of the GrUpRORFact results in the table above showed that the results produced by the two procedures are quite different. This is because the rate of return in each year is calculated based on net investment. As the

depreciation schedule is different for the two procedures, the rate of return factor would also turn out to be different. This would occur even for straight line depreciation. In the above example, the FCC Model would lower net investment by $0.1 for each $1 of investment over 10 years while in the correct procedure the same lowering would occur only over an 8 year period, the balance $0.2 being recovered from net salvage at the end of 8 years. Thus, in the above example after using NPV and levelization process we would get a rate of return ("ROR") factor of 0.08242 using the FCC Model methodology while the correct factor should have been 0.09270.

20. The ACF (CCCFact) in the table above is the sum of the DeprecFact and the GrUpRORFact. The ACF is used to calculate the capital cost associated with each category of investment. Since the FCC Model uses an incorrect ACF as explained above, the costs produced by the Model are incorrect.

**Structure Sharing**

21. The HCPM module of the FCC Model permits the percentage of structure assigned to the telephone company to vary by Density Zone. This structure percentage is applied to calculate structure investments. The FCC Model expense modules also contain a set of inputs for structure sharing by Density Zone. Use of both sets of inputs leads to the structure sharing percentage being applied twice, thus improperly lowering costs.

22. Retaining the structure sharing percentages in the expense modules causes additional methodological problems in the Wire Center expense module. The Wire Center Module arbitrarily applies the sharing percentage for the density zone 650 – 850 to the entire wire center. The effect of sharing is not included until total investment for the wire center is calculated. Thus, information based upon density zones can no longer be used – any wire center is a composite of several different density zones.

**Operating Taxes**

23. Operating taxes are calculated in the FCC Model either based on costs other than overhead and customer operations costs or on a per line basis. In actual practice, operating taxes are levied either on revenue or on investment. There is no methodological justification for the FCC Model to depart from current practice. This flaw cannot be corrected by input changes because it is hard coded in the FCC Model.

24. For the portion of operating taxes based on revenue, costs produced by the Model may be used in place of revenue for calculating operating taxes, but it should be all costs. Thus, it should include overhead and customer operation costs as well. Leaving out overhead and customer operation costs from the tax base improperly underestimates the operating taxes. This flaw cannot be corrected by input changes because it is hard coded in the FCC Model.

**Marketing Expenses**

25. The FCC Model's expense modules do not allow any input in the form of marketing expenses. An appropriate portion of marketing expenses must be included in Universal Service Cost estimates. GTE does not seek recovery through universal service studies for marketing activities that are specifically geared towards the sale of non-supported services (such as dedicated services, toll and access services, customer premises equipment ("CPE"), vertical features, etc.). There are joint marketing expenses, however, that support the sale of overall GTE products and services which should, in part, be assignable to the cost of universal service. In addition, marketing expenses incurred specifically for the purpose of promoting basic residential and business services should be included in their entirety.

26. In a competitive environment, all companies advertise (note the experience of Inter-exchange carriers). Going forward, GTE will require at least the same level of advertising expense it incurs today, and should be able to recover these costs from the services it provides, including universal service. Furthermore, consistent with the FCC's directive, several states have indicated that they will require incumbent local exchange carriers ("ILECs") receiving universal service support to advertise the availability of supported services. Therefore, these costs should be included in the determination of universal service support. The failure to account for the properly incurred marketing and advertising expenses is yet another flaw in the FCC Model.

## MODEL INCONSISTENCIES

### Serving Area Interface ("SAI") Expenses

27. While the Density Zone Module uses the underground fiber expense to investment factor for calculating expenses associated with SAI, the Wire Center module uses the underground copper expense to investment factor. This discrepancy must be rectified. Moreover, for some unstated reason the expense to investment factor in both modules is based on underground cable. In the absence of explicit inputs for SAI expense to investment factor, some assumptions may be needed but it is inappropriate to base the factor only on underground cable. This is supported by the fact that for calculating capital costs associated with SAI investment, a composite life derived using aerial, buried and underground cable is used. Since an underground cable expense to investment factor is typically the lowest among aerial, buried and underground factors, use of only the underground factor in the expense calculations tends to unduly lower the costs.

### Underground Feeder Placement Costs

28. In both expense modules, the Conduit expense to investment factor is applied for expense calculation purposes with respect to underground feeder placement costs, while for capital cost development the FCC Model utilizes the life for Underground Metallic & NonMetallic Cable. It is methodologically inappropriate

to treat these calculations differently. Both calculations should utilize the input for Underground Cable.

**MDF/Protector**

29. Both expense modules use the Digital Circuit Equipment's life for MDF/Protector. There is no justification for this approach. The appropriate life would have been a combination of switch and outside plant lives.

**Drop and Terminal Lives**

30. Neither of the expense modules have explicit inputs for drop and terminal lives, and instead use an average metallic cable life in the cost calculations. The life is an average of aerial, buried and underground cable lives.[2] It may be inescapable to use some average based on cable lives for the lives of investments that can not be individually identified. However, in case any of the investments can be identified closely with a particular investment category it would be more appropriate to assign to it that life. Thus, for aerial and buried drops, it is better to use the lives for aerial and buried cable respectively. The same is true for aerial and buried terminals.

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[2]The average life calculated is not based on an investment-weighted average basis, but a complicated formula that can not be easily explained

*Investment weighted life* = $(I_a L_a + I_b L_b + I_u L_u) / (I_a + I_b + I_u)$

*Model formula* = $(I_a + I_b + I_u) / [(I_a/L_a) + (I_b/L_b) + (I_u/L_u)]$

with $I_a$ and $L_a$ being aerial Investment and aerial life respectively and so on for buried ($I_b$ and $L_b$) and underground ($I_u$ and $L_u$).

**General Support Allocators**

31. In both expense modules, the network support investments are reduced by a factor (1 - 'Total Operations General Support Allocator') and the general support investments are reduced by a factor 'Office Worker General Support Allocator'.[3] This presumably takes out the fraction that can be ascribed to corporate and customer operations expenses. There is no justification for removing these expenses and reallocating them to corporate and customer expenses since corporate expenses are ultimately allocated to UNEs the same way the support expenses are allocated. A cause for even greater concern is that it does not appear that the above removed expenses were included while developing the Corporate overhead factor or the Bill/Billing Inquiry expenses, thus leaving out a big portion of the support expenses in the cost calculations.

**Local Signaling Costs for USF**

32. A difference in the methodology is found in the way the Density Zone module and Wire Center module assign the local portion of the signaling costs. In the

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[3]The methodology used for developing the OfficeWorker General Support Allocator is difficult to comprehend. The formula used for removing Corporate and Customer Expense in the Total Operations General Support Allocator is quite transparent:

*Total Operations General Support Allocator = (Corporate Exp + Customer Exp) / Total Exp*

The same is not the case for Office Worker General Support Allocator:

*Office Worker General Support Allocator =*
*[Network Operations Exp + Corporate Exp * (Cable & Wire Exp + Switch Exp +Transmission Exp + Operator Exp + IOT Exp + Network Operations Exp) / (Cable & Wire Exp + Switch Exp + Transmission Exp + Operator Exp + IOT Exp + Network Operations Exp + Customer Exp)] / [Network Operations Exp + Corporate Exp + Customer Exp]*

Density Zone file, the UNE costs for signaling are first calculated on a cost per call basis. To arrive at the cost per line for universal service fund ("USF") calculations, the UNE cost is multiplied by the factor:

*(Interoffice Local Actual Min * Interlata Calls Completed / IXC switched access MOU / switched lines).*

In the Wire Center module the USFcost is derived from the total signaling cost by multiplying it by the factor:

*(Interoffice Local Actual Min / Total Actual Min / switched lines)*

Since the two multiplying factors differ, the USF costs for signaling are also likely to be different in the two modules. Aside from the difference mentioned above, it is incorrect to use the ratio of InterLATA Calls Completed and interexchange carriers ("IXC") switched access minutes of use ("MOU") in the Density Zone module. The appropriate ratio should have been derived using Total Interoffice Calls Completed and Total Interoffice Switched Access Minutes. In the same way in the Wire Center module, the Total Actual Minutes used in the denominator ought to be replaced by Total Interoffice Actual Minutes since signaling costs are likely to arise only from interoffice calls.

## MODEL ERRORS

### Feeder Underground Costs

33. In the Wire Center module the formula for Feeder Underground Costs (Investment inputs tab, column DH) fails to include the structure sharing impact. The effect of this is to assign to the ILEC all the underground costs, irrespective of any sharing.

### Distribution Underground Trenching Costs

34. The Wire Center module (Investment inputs tab, column CN) also contains the same error for distribution underground conduit costs by not taking into consideration the sharing of structures in the Wire Center calculation.

### Composite Non-Metallic Cable Life

35. The average non-metallic cable life is calculated using aerial, buried and underground non-metallic cable investment and lives. But in the formula while calculating the aerial cable non-metallic investment (Inputs tab, cell L28) the Density Zone module's formula only adds the investment for direct transport aerial and dedicated transport aerial for only the density zone 850 - 2550 and not the total for all density zones. Since not all aerial cable non-metallic investment is included, the formula produces incorrect average non-metallic cable life.

**EO Wire Center Direct Cost**

36. In both expense modules, the formulae (Density Zone: EO Switching tab, row 18; Wire Center: Investment inputs tab, column DK) overstate the capital cost of land by overstating the taxable equity portion of return. The use of Weighted Equity Fraction ("EquityP") rather than Equity Fraction ("EquityF") is not appropriate since the investment is only financed with the relative proportion of debt & equity in the capital structure - not the debt and the equity portion of return.

## CONCLUSION

37. The FCC Model is incomplete and to a large extent is still a black box. It suffers from several methodological and structural errors. Until more analysis can be performed, the full scope of the errors cannot be determined and it would be irresponsible to use the FCC Model as the platform to estimate the universal cost for any company.

I hereby swear, under penalty of perjury, that the foregoing is true and correct.

Subhendu Roy

Subhendu Roy

Subscribed and sworn to before me this 17th day of December 1998.

Retha Collins

Notary Public

My Commission Expires: Sept. 9, 2002

RETHA COLLINS
NOTARY PUBLIC
State of Texas
Comm. Exp. 09-09-2002