Proposal for a Competitive and Efficient Universal Service High Cost Funding Model/Platform

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May 5, 2003

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Introduction

We are at a point in time when the goals and implementation of a fair, affordable, and balanced Universal Service system are being compromised by the tools used to measure and implement Universal Service. The FCC's Synthesis Model was released over 5 years ago; at the time, it was an up-to-date tool for calculating telecommunication cost in regard to the provision of Universal Service. However, the telecommunications environment in the mid to late 1990's was one in which competition was minimal, the base technology to provide service was a landline network, and dial-up service was the standard approach to access the internet.[2]

As we all know, the telecommunications landscape has changed dramatically over the last 5-10 years. Wireless phones are a part of everyday life, high-speed access is becoming the norm, IP telephony is now available, competition has entered the marketplace, and Unbundled Network Elements from incumbent local exchange carriers ("ILECs") are being used in many jurisdictions. However, the model algorithms, the modeled technologies, the inputs, and the customer data have not been updated to keep up with the changing landscape.

The purpose of this paper is to lay the groundwork for the need and the requirements of an updated Universal Service modeling platform that would calculate support for non-rural and rural telephone company areas. This paper will cover the background of telecommunications modeling, the requirements of Universal Service models, noted deficiencies in the current Synthesis Model, the paradigm shift as a result of wireless service, and proposed modeling principles.

Background

One of the goals of any network cost modeling exercise is to obtain as accurate an answer as possible given the regulatory guidelines, data available, and technological constraints at that point in time. However, the optimal regulatory approach should not be artificially constrained by the modeling approach selected. Ideally, commenters in this

1. James Stegeman is the President of CostQuest Associates, Inc. Mr. Stegeman formed CostQuest Associates, Inc. in 1999. Prior to CostQuest, Mr. Stegeman worked in a variety of positions at INDETEC International, the last of which was Executive Vice-President. He joined INDETEC in 1995. Prior to INDETEC, he spent 7 years in a variety of Financial and Regulatory management positions with Cincinnati Bell Telephone. Mr. Stegeman has a B.S. in Mathematics and Statistics from Miami University of Ohio and has an M.S. in Statistics from Miami of Ohio.

2. At the time the proxy models were being developed, parties to the modeling proceedings were arguing whether 14 or 28Kb dialup service defined advanced services.

proceeding will help identify *the approach, data sources, constraints, and tradeoffs so that the Commission can make informed decisions as to how best to move forward on creating a Universal Service platform that is efficient, fair, balanced, fully applicable, and accurate*.

Historically, there have been a number of network modeling approaches used to estimate costs. Each approach was developed at a point in time to answer a specific question and typically geared to meet a stated regulatory approach and/or goal. However, that does not mean that a technique chosen in the past is ideally applicable today or in the future. While one approach may have been useful in the past, it may have been eclipsed in accuracy and robustness by ensuing approaches or shifts in regulatory goals.

In broad terms, network cost modeling approaches have tended to fall into one of the following four categories:

- Fully distributed cost of the embedded plant,
- Sampling or parametric modeling,
- Proxy models based on publicly available data, and
- Next Generation models.

The fully distributed cost approach of the embedded books is a methodology that spread, in a top-down fashion, the booked expenses of the company based on high-level cost drivers. This approach generally fell out of favor as economic, forward looking costs became the standard of developing telecommunication costs. However, perhaps due to the limitations of the current proxy model or perhaps because of pressure by interested parties, this method was chosen for determining the Universal Service funding for rural carriers.

Sampling or parametric modeling methods were developed as the first generation approach to developing forward-looking costs. With limited computing capability and lack of electronic data, sampling was the cost effective and sensible approach to calculating costs at a fairly broad level. However, sampling ignores the wealth of data that is available today that can easily be manipulated by today's business class computers.

In recognition of the deficiencies of sampling, Proxy models were developed to employ a greater use of available data and to capture a full census of network elements. The initial proxy models (CPM, BCPM, HAI, and the FCC's Synthesis Model) were attempts at full-census models but were developed without access to much of the actual customer data, the road network information (allowing better information on customer location and the rights-of-way for network paths along roads), the services provisioned at each point within the network and the telecom or network routing data. For example, customers obtained from non-ILEC sources (including population census data), were randomly assigned to geographic locations and were assumed to only have basic service. In addition, the algorithms employed by the models were somewhat limited and at times simplistic. For example, without the use of roads, actual customer locations, and plant data, network routing was assumed to be always rectilinear (i.e., right angled) and did not follow valid rights of way (e.g., roads). In fact, the routing ignored most natural hindrances (e.g., houses, rivers, mountains, etc…). Finally, the initial proxy models were fairly rigid in their approach. These limitations were not intentional but rather an outcome of initial data limitations and the learning process of developing this new approach.

The Next Generation tools, such as BellSouth's BSTLM-CostPro, have improved upon the initial proxy models by implementing more advanced plant placement and routing algorithms and by utilizing more actual data (ILEC customer, services, services requirements, roads, and ILEC plant data) when and where it exists. In addition, these Next Generation platforms are open, transparent, and fairly robust in that the majority of network engineering drivers (such as customers served from a DLC or copper gauge crossover) are now user adjustable inputs that can be easily manipulated to meet the specific criteria of the cost study.

Criteria for a Universal Service Model

A guiding principle of developing the cost of service in recent telecommunications regulatory proceedings around the world has been the use of forward-looking cost studies. This holds true for interconnection, unbundled elements, and Universal Service. The U.S. has been an early proponent of forward-looking cost approaches. In fact, the FCC (with input from the Joint Board) made it quite clear in its Report and Order on Universal Service (in CC Docket No. 96-45 (FCC 97-157), issued on May 8, 1997, that forward-looking economic costs should be used to determine the cost of providing Universal Service in rural, insular, and high cost areas. In addition, the order provided ten criteria designed to guide the review and acceptability of any cost values provided in Universal Service Funding proceedings. The criteria as provided in the Report and Order are listed here (emphasis added):

> *"250. Criteria for Forward-Looking Economic Cost Determinations. Whether forward-looking economic cost is determined according to a state-conducted cost study or a Commission-determined methodology, we must prescribe certain criteria to ensure consistency in calculations of federal universal service support. Consistent with the eight criteria set out in the Joint Board recommendation, we agree* ***that all methodologies used to calculate the forward-looking economic cost of providing universal service in rural, insular, and high cost areas must meet the following criteria****:*
>
> (1) ***The technology assumed in the cost study or model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed.*** *A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers.* ***The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services****. For example, loading coils should not be used because they impede the provision of advanced services. We note that the use of loading coils is inconsistent with the Rural Utilities Services guidelines for network deployment by its borrowers. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.*

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

(3) ***Only long-run forward-looking economic cost may be included****. The long-run period used must be a period long enough that all costs may be treated as variable and avoidable****. The costs must not be the embedded cost of the facilities, functions, or elements.*** *The study or model, however, must be based upon an examination of the current cost of purchasing facilities and equipment, such as switches and digital loop carriers (rather than list prices).*

(4) *The rate of return must be either the authorized federal rate of return on interstate services, currently 11.25 percent, or the state's prescribed rate of return for intrastate services. We conclude that the current federal rate of return is a reasonable rate of return by which to determine forward looking costs. We realize that, with the passage of the 1996 Act, the level of local service competition may increase, and that this competition might increase the ILECs' cost of capital. There are other factors, however, that may mitigate or offset any potential increase in the cost of capital associated with additional competition. For example, until facilities-based competition occurs, the impact of competition on the ILEC's risks associated with the supported services will be minimal because the ILEC's facilities will still be used by competitors using either resale or purchasing access to the ILEC's unbundled network elements. In addition, the cost of debt has decreased since we last set the authorized rate of return. The reduction in the cost of borrowing caused the Common Carrier Bureau to institute a preliminary inquiry as to whether the currently authorized federal rate of return is too high, given the current marketplace cost of equity and debt. We will re-evaluate the cost of capital as needed to ensure that it accurately reflects the market situation for carriers.*

(5) ***Economic lives and future net salvage percentages used in calculating depreciation expense must be within the FCC-authorized range****. We agree with those commenters that argue that currently authorized lives should be used because the assets used to provide universal service in rural, insular, and high cost areas are unlikely to face serious competitive threat in the near term. To the extent that competition in the local exchange market changes the economic lives of the plant required to provide universal service, we will re-evaluate our authorized depreciation schedules. We intend shortly to issue a notice of proposed rule making to further examine the Commission's depreciation rules.*

(6) *The cost study or model must estimate the cost of providing service for all businesses and households within a geographic region. This includes the provision of multi-line business services, special access, private lines, and multiple residential lines. Such inclusion of multi-line business services and multiple residential lines will permit the cost study or model to reflect the economies of scale associated with the provision of these services.*

(7) *A reasonable allocation of joint and common costs must be assigned to the cost of supported services. This allocation will ensure that the forward-looking economic cost does not include an unreasonable share of the joint and common costs for non-supported services.*

(8) *The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.*

(9) ***The cost study or model must include the capability to examine and modify the critical assumptions and engineering principles.*** *These assumptions and principles include, but are not limited to, the cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.*

(10) *The cost study or model must deaverage support calculations to the wire center serving area level at least, and, if feasible, to even smaller areas such as a Census Block Group, Census Block, or grid cell.* ***We agree with the Joint Board's recommendation that support areas should be smaller than the carrier's service area in order to target efficiently universal service support****. Although we agree with the majority of the commenters that smaller support areas better target support, we are concerned that it becomes progressively more difficult to determine accurately where customers are located as the support areas grow smaller. As SBC notes, carriers currently keep records of the number of lines served at each wire center, but do not know which lines are associated with a particular CBG, CB, or grid cell. Carriers, however, would be required to provide verification of customer location when they request support funds from the administrator."*

In addition to these criteria, there are numerous related issues that impact the modeling effort and results. While many of these issues have been addressed in the past, it is recommended that a thorough review be conducted to make sure the best, currently available approach is used. Several questions must be addressed:

- What is the cost object, that is, what does Universal Service entail:
  - What services are included and must be modeled?
  - What non-recurring costs and revenues are to be included?
  - What other costs and revenues should be included?
- What are the economic criteria:
  - What is meant by scorched node?
  - What defines an efficient network?
  - How should shared resource costs be attributed to services?
  - What is included in TELRIC costs?
  - What defines forward looking?
  - How should inputs be derived?
- What are the Regulatory criteria:
  - What is the geographic unit for determining the Universal Service Fund?
  - What is the basis for inputs?
  - What are the cost apportionment approaches for shared assets?
  - What are the forward looking assumptions for structure sharing?
  - Should there be methods employed to differentiate rural and non-rural areas and/or carriers?
- What are the Engineering Criteria:
  - What network components need to be modeled?
  - What are the technologies and how are they implemented?
  - What are the criteria to select varying technologies?
- What are the range of modeling options for each part of the platform:
  - General modeling options:
    - What level of detail should be available to the user?

    - What is the basis for inputs?
    - What should the user have control over?
    - What are the security and encryption requirements?
    - What are the input and output options?
    - Should the model have mapping capability?
    - What is the source and basis for the engineering and cost inputs?
    - What services are included in Universal Service versus which services are modeled?
    - How should the model be deployed?
  - Loop:
    - What are the engineering criteria for the facilities, electronics and structure?
    - Should Rectilinear or Minimum Spanning Road Tree routing, clustering, and the resulting distances be used
  - Wireless:
    - What technology should be used?
    - Where is it deployed
    - What does scorched node mean?
    - What defines local usage?
  - Switching, Transport, Signaling:
    - What vendor information should be used?
    - How will the vendor information be obtained?
  - Benchmark approach:
    - Should the cost benchmark continue to be used?
    - What should be the percentage break for funding?
    - What adjustments should be made?
    - Should there be methods employed to differentiate rural and non-rural areas and/or carriers?
    - What customers are to be considered?
  - Operating costs
    - What cost are covered?
    - Can actual company data be used?
    - Should there be methods employed to differentiate rural and non-rural areas and/or carriers?
    - What adjustments should be made?
  - Conversion of Investment to monthly Recurring costs:
    - What are the specific depreciation, tax and cost of money approaches?
    - Should there be methods employed to differentiate rural and non-rural areas and/or carriers?
    - Can existing approaches be used?
  - What is the geographic entity for calculation and reporting?
    - Should the unit be the same between rural and non-rural areas?

A final point to keep in mind is that all network cost models produce estimates of "cost". Each modeling approach has/had advantages, and each approach uses some surrogate or "proxy" data. One key issue in modeling the network is to continue the evolutionary process by trying to incorporate as much "actual/realistic" data as possible to ensure that the results are as accurate as possible. In the past, portions of the data needed for modeling were unavailable. As a result, estimates or proxies were used. While these substitutes may have been the best possible approach at the time, they may be dismissed today or rate as only the second or third best choice. As the model is updated (or a new model chosen), key inputs that should be reviewed in any new modeling exercise include:

- Customer locations
  - Via company records, or public data
- Service types and estimated locations
- Service territory boundaries
  - Whether it is exchange boundaries for landline operators or Cell areas for wireless carriers
- Technology choices
  - Wireline, wireless, fixed wireless, other
- Plant placement, type, size
- Plant routing
- Plant costs
- Sharing

With a clear set of criteria, an understanding of the data that is available, and answers to many of the questions above, an up-to-date and accurate model to estimate the forward looking costs of Universal Service can be implemented that is both applicable and accurate for rural and non-rural areas and carriers.

Review of Current Funding Determination Deficiencies

In 1998, the FCC released the much anticipated Synthesis Model for determining the Universal Service funding in the U.S. From its inception, the FCC's Synthesis Model was geared to be used to develop funding for non-rural carriers. A key issue of whether the platform would be applicable to rural carriers (not necessarily rural areas) was left open for discussion.

Five years later, a track record of dealing with issues related to the use of the Synthesis Model now exists. It is useful to consider a number of the issues with the Synthesis Model from two different perspectives: Rural Carriers versus non-Rural Carriers.

The Synthesis Model has been used to derive the Universal Service funding for non-rural carriers at both the federal and state level. However, this has not been without controversy. In proceedings to date a number of issues have been raised including:

- The use of Statewide averages to determine who is to receive funding;
- The use of a cost benchmark with a 135% break point;
- The lack of updated customer location data;

- The lack of specificity in the special access demand in the model;
- The line demand to use in the model with competition grabbing an increasing shares of the local market;
- The lack of recognition in the customer dataset of:
    - Multi-tenant structures
    - Second lines
    - High cap lines
    - Lots;
- Potential overbuilding of the distribution loop plant;
- Inadequacy of the HAI vendor switching inputs;
- Lack of update to the cost inputs;
- Lack of access to the customer dataset;
- Use of rectilinear distances to cluster and route, which do not follow roads or observe any natural hindrances to routing;
- Use of pair equivalents to build all components of the network and to allocate the cost of all components out to services (including fiber and electronics);
- Poor quality of Exchange boundaries; and
- Use of V&H coordinates to locate central office switches.

Clearly, the discussion of these items could populate an extensive paper, but they are identified here only to indicate that the current Synthesis Model can be improved.

Regarding rural cost estimates, the Rural Task force evaluated the Synthesis Model based on the FCC's own 10 criteria and additional criteria listed in Appendix D of the Rural Task Force's White Paper #4 (provided in Appendix B). Using these criteria, the Rural Task Force found major issues with the FCC's Synthesis Model and recommended that it not be used. Their summarized concerns with the FCC's platform are as follows:

- Modeled lines differed significantly from actual lines
- Modeled route miles varied significantly from actual route miles
- Modeled plant installed did not line up with actuals
- Wire Center Areas and boundaries in the model did not match up to actuals
- Model underestimated Switching investment
- Modeled General Support investment varied significantly compared to actual
- Model underestimated Network Operations costs
- The use of a Statewide Average cost was inappropriate

Given the Rural Task Force's concerns over the applicability of the Synthesis Model to the rural carriers, they recommended that an embedded cost determination should instead be used to set the funding levels. The FCC agreed and subsequently ordered a 5-year plan that is largely an implementation of a Universal Service funding platform based on the embedded costs of the Rural Carriers, seemingly in the face of prior FCC rulings, the FCC's own Universal Service criteria, and the preponderance of regulatory proceedings that rely on forward looking costs.

In the initial order and subsequent orders, the FCC has laid out a funding platform for rural carriers that differs significantly from that used for non-rural carriers. For example (not an exhaustive list):

- Embedded cost for Rural carriers versus Forward looking costs for non-Rural carriers;
- For Rural carriers, the use of the embedded books fails to capture:
  - Forward looking sharing percentages;
  - Forward looking plant placements (aerial, buried, and underground percentages);
  - A network capable to providing advanced services to all customers;
    - For example, no guarantee that the 18,000ft limit on copper is employed;
  - Forward looking and currently deployed technologies;
  - FCC prescribed depreciation rates;
  - The costs of an efficient carrier;
- Operating area average cost funding determination for Rural carriers vs. Statewide average cost funding determination for non-rural carriers;
- 115% cost threshold (compared to a fixed $240 annual cost) for determining funding requirement for Rural carriers versus a 135% cost threshold (compared to variable annual cost) for non-Rural carriers; and
- Current operational costs for Rural carriers versus efficient provider costs for non-Rural carriers.

Whether this dual system (Rural versus non-Rural) is fair, economically efficient, or in line with the Telecommunications Act is the subject of on-going debate. What seems quite clear is that the apparent limitations of the FCC's Synthesis Model have contributed to a Universal System that leads to disparate treatment of carriers and their customers. Irrespective of the carrier's classification and any requirement to be funded, the Telecommunications Act was quite clear in stating that all customers should have equal access to comparable levels of service at equivalent rates across the country, as stated in Section 254.b.3:

> *`(3) ACCESS IN RURAL AND HIGH COST AREAS- Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.*

Yet, under the current system similarly situated customers (e.g., those with very similar loop costs) are treated differently based on their providers' classification. This may lead to different service treatment, different incentives for reinvestment in the customer's facilities, different service prices, and different incentives for competition and deployment of alternative technologies.

Many of these disparities could be avoided and/or minimized (and many of the issues raised by the Rural Task Force could be addressed) if an updated Universal Service platform were developed in combination with a consistent set of funding guidelines that are based on the costs of serving customers, not contingent on the customer's carrier.

Impact of the Telecommunications Paradigm Shift

As discussed in Dr. Steve Parsons' paper "*A Paradigm Shift in Concepts of Universal Service*,"[3] the concepts of what defines Universal Service have shifted since the Telecommunications Act was adopted and the FCC's Synthesis Model was released in 1998. This is quite accurately summarized in Dr. Parsons' statement:

> *"Given the historical growth of landline telecommunications infrastructure, the concept of interconnecting citizens had the practical effect of placing landline infrastructure to interconnect locations where citizens spent most of their time: homes and businesses. However, this perception of universal service has changed in at least two important aspects over time. First, universal service is no longer predicated on interconnection and telephone service via landline facilities. And second, the demand for connectivity to the SPTN ["switched public telecommunications network"] occurs across time and space."*

With this paradigm shift, a concerted effort must be made to ensure that the modeling approach to fund Universal Service recognizes this shift. Quite simply, we need to make sure the Universal Service model accounts for and recognizes wireless as a realistic option in the provision of Universal Service.

This new modeling approach could be accomplished in the following manner. First, the model should capture the cost of both wireline and wireless technologies where they are available. Second, with twin goals of the Telecommunications Act and the FCC's implementation of the Act to encourage competition while providing Universal Service, a funding apparatus needs to be set up to match these goals. Quite simply, the Universal Service fund should encourage cost and operational efficiency, ensure Universal Service, encourage service innovation and the delivery of advanced services, and encourage competition.

Proposed Model / Platform Principles

<u>Recommendation</u>: the FCC should develop an updated/new Universal Service model that is applicable to rural and non-rural carriers, accounts for competition, accounts for alternative technologies, uses the latest and greatest data sources, and is robust enough to address changes in the market that have occurred and will occur in the future.

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3. "*A Paradigm Shift in Concepts of Universal Service*," by Steve Parsons, is attached to Western Wireless' Comments filed with the FCC in CC Docket No. 96-45 on May 5, 2003.

Before such a model is developed, the FCC guidelines should be reviewed in order to determine if they are still applicable, what impact the paradigm shift has had, and whether updates need to be made. For instance, should Universal Service funding still be based upon 'the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed'?

Once the fundamental guidelines of Universal Service funding are set, a number of the key criteria guiding the development of the platform should be agreed upon, and should include or address the following items.[4]

1. Economic and Funding Area Criteria

The cost calculation and the method of funding calculated in a model should be consistent with the Act, FCC orders, and basic economic theory. This includes the use of forward-looking costs.

Economist and Regulatory agencies generally agree that Universal Service funding based on forward-looking costs is more efficient than historical costs.[5] It provides superior incentives to control costs, superior incentives to innovate, add value in service to customers, and superior incentives to choose the best technology for the market circumstance.

Additional criteria include:

- The implemented model should follow the principles as laid out by the FCC, irrespective of the ILECs classification (rural, non-rural). This includes:
  - Scorched node
  - Forward looking
  - Efficient provider
- The determination of costs and the funding levels should be consistent across every exchange area.
- The geographic level at which funding is determined should be at a consistent level irrespective of the ILEC's classification.
  - Geographic funding level should address economic principles of the Act and the FCC criteria and not create economic barriers
    - This could be at exchange level or disaggregation zone
- If disaggregated areas are to be used for funding determination, the model should be able to identify the fund level by these areas.
- The Exchange boundaries and disaggregation area boundaries used in the modeling should be the same as those used to determine funding disbursements.

4. This includes the most important items but is a partial list of relevant criteria.

5. Funding should be independent of the rates charged and irrespective of the embedded costs of the incumbent. Rather, they should reflect the costs of an efficient provider in a competitive market. Should a competing carrier enter the market, they should understand the funding and make the entry based on some perceived advantage (cost, service, or some combination).

Additionally, these boundaries should be available to all parties in a useable electronic format (polygons in either MapInfo or ArcInfo format).

- If disaggregation areas continue to be used, the development of disaggregation areas should be standardized to minimize any potential "gaming" of the system.

2. Data requirements for modeling

One key to the production of accurate costs and funding is the data used to populate and run the platform. Keep in mind that the current Synthesis Model data is over 6 years old and was developed, in part, to account for lack of access to actual data. In addition, the infancy of the proxy approach and computing power at the time constrained the data and algorithms that were used. Given the evolution in proxy modeling, an understanding of the current deficiencies, an increase in computing power, and an evolvement of the algorithms used to model the network, a careful review of the required data needs to occur to ensure that the model is not limited nor impacted by the data availability. The key data elements include:

- Modeling Inputs (e.g., prices, labor rates) should account for the service area unique attributes.
    - Switching prices should reflect up-to-date vendor prices at realistic discount levels.
- Customer records should be updated and improved and represent the full population of customers in an area irrespective of their selected carrier. Additionally, the customer data needs to be provided at the actual geocoded[6] location of the customers.
    - The source of the data must be determined. Possible sources are:
        - Sampling of company customer records,
        - Full array of company customer records,
        - Census Data, and
        - Public Sources.[7]
    - The final customer data set will most likely require the melding of multiple data sources to get a complete customer data set. That is, even if the company data is geocoded, it is very likely that some records will not be locate-able (that is geocoded to an exact latitude and longitude). Through the use of other sources of data, such as census data and roads, a surrogation technique needs to be employed to best approximate the location of the non-geocodable customers so that the final data set for the model contains 100% of the customer records.
    - The customer data should capture second lines and model accurately their impact on network costs.

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6. Address geocoding matches a customer record (which includes the services at the address) to a location on the side of a street by address range to yield a latitude and longitude.

7. CostQuest has access to an up-to-date publicly available customer dataset that contains Residential and Business data including telecom demand for most types of services.

    - The customer data should capture both lots and customers to account for the difference in plant requirements between a single tenant structure versus a multi-tenant structure.
    - The development of the customer data should be fully documented.
- Telecommunication plant location and boundaries should be as accurate as possible.
    - Exchange Areas, switch location and Wireless service territories need to be obtained from either the companies involved or from a public source.[8]
    - As with the customer data, the method employed will need to use a number of sources to guarantee that all data is utilized.
- All parties should have access to review the data and development.
- The FCC should institute a yearly update of the customer data to keep it up-to-date and relevant.

3. Updated Modeling Platform

The updated modeling platform should be an easy to use, open modeling approach for generating accurate forward-looking network costs. The modeling approach should include the following features:

- Recognize rural and non-rural engineering approaches and technologies to be used for both the landline and wireless networks.
- Designed to be easily maintained and updated so as to minimize future costs to refresh the results.
- Improve the current Synthesis Model approach by using more actual information on current customers and network.
- Ability to handle as little or as much data as is available.
    - Customer and service points.
    - Exchange location and boundary.
    - Road data.
- Include multiple technology choices.
    - Provide toggles to control modeling of different technologies and technology choices.
- Use Minimum Spanning Road Tree ("MSRT") for creation of the clusters, and the routing of both the distribution and feeder network to design an efficient, optimal network.
- Design a Scorched Node model using actual exchange locations or cell sites.
- Build the network to the customer, do not move customer to the network.
- Include all processing in the model (including clustering).
- Incorporate variable copper distribution length design point.
- Recognize multi-dwelling units and office buildings and the vertical cabling that may be required in these buildings.
- Use best available surrogation techniques to obtain a reasonable location for items that do not geocode adequately.
    - Capture individual service areas of the technology.

8. CostQuest has access to the one of the most accurate Exchange boundary and switch location file datasets.

        - License area and cells for Wireless.
        - Operating areas and exchanges for Wireline.
    - Model wireless irrespective of landline network.[9] That is, capture the unique engineering characteristics of the technology.
    - Summarize cost on an Exchange basis to provide unit of comparison
- Use of all customers (irrespective of the customers choice of provider).
    - This is the theoretical base of customers served by a technology.
- Model accurate costs for efficient Switching, Transport, Signaling, and Network Operations.

4. Funding determination

A funding approach based on the model platform needs to be instituted that encourages competition, operational and cost efficiency, service innovation and deployment of advanced services to all customers, and provides Universal Service while minimizing the size of the overall fund. The following provides a high level specification to meet these objectives.

- Run a purely wireline and a purely wireless version of the model.
    - Use all customers (irrespective of the customers choice of provider).
        - This is the theoretical base of the maximum number of customers that could be served by a technology in an area.
    - Calculate the cost at this full demand for both wireline and wireless technology. Drop demand by increments of 5 to 10% to determine the cost of service as competition takes lines. That is, what is the cost of an efficient provider who serves 80% of the market, 70%, etc.
- Capture this cost curve for each exchange (current incumbent exchanges provide a common level of geography) and each technology.
- Compare costs by exchange and/or disaggregation area.
- Determine the cost crossover point based on the cost/demand curves of the two technologies. This crossover point represents the theoretical minimum cost of an exchange and the optimal funding level, **assuming the existence of two competitors.** Using this crossover point provides incentive to both carriers to optimize demand (i.e., stay on their side of the crossover point).

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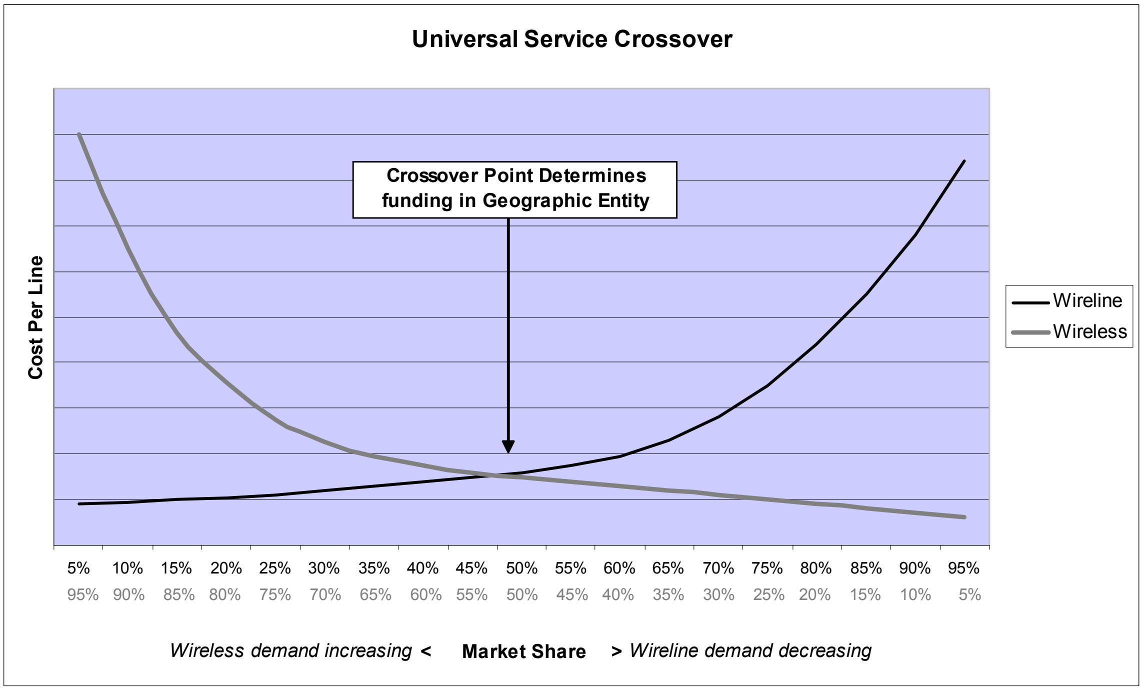
9. Exchange boundaries have little to do with the construction of the wireless network.



- If there is no crossover, then the least cost technology at full demand (100% market share) sets the funding level. This would discourage inefficient technology.
  - This crossover approach should encourage efficient technology, efficient operations, and service innovation with the existence of two competitors.
  - Each participant should receive funding on a per line basis of the customers they serve. This provides the incentive to maximize penetration and minimizes any overfunding for an exchange.[10]
    - Note that with this change in funding approach, there may need to be a transition period for existing ILECs to adjust to any reduced level of total funding.
  - Funding and cost calculations should be consistent with regard to second lines for the same type of technology (i.e., whether second lines are funded should be determined in part by how second lines are treated in the cost estimation process).

Impact of Proposed Model Principles

The principles of the proposed model, data selection, and platform should address most of the issues raised by the Rural Task Force. The approach will meet the current FCC criteria for a Universal Service Cost model for all carriers, and it will recognize the competitive marketplace that is evolving in both the Rural and Non-Rural areas and the paradigm shift in Universal Service as a result of wireless. In addition, the principles of the proposed model recognize the potential for alternative technologies meeting the Universal Service criteria.

10. This will affect the funding level to the provider, but not the funding level for the geographic area. This also provides an economic incentive to compete for customers, provide services of value, and to reduce costs. Basically, competitors will enter when they see the opportunity to succeed.

Funding under the proposed approach will reflect the costs consistent with having competition exist in rural areas. The funding will be explicitly calculated on the basis of the least cost of competitive provision of service. Funding will be competitively neutral and will encourage competition, innovation and efficiency. Payment mechanisms will be far more competitively neutral than the current system. Firms will be able to compete on their underlying merits rather than one firm gaining an unfair advantage based on USF rules. Finally, society will be better off as more efficient firms and technologies will expand service, provide higher levels of value and/or lower prices for comparable levels of service.

While the principles will support competitive Universal Service, competitive Universal Service is still based on customer choice. Competitive Universal Service will mean a greater array of customer choices of technology, firms, services, and offerings. This will encourage more efficient technologies and encourage more efficient companies. Competitive Universal Service will also provide diversification of facilities (security and redundancy).

Finally, the new approach should address any Windfall / Inefficiency / Over-recovery issues.[11] The current system does not encourage efficient operations of wireline providers in the rural areas. Since all cost are basically recovered, the carrier has no incentive to become efficient. As customers are lost to competitors, the incumbent in effect still recovers funding to cover all costs. With the new approach, the costs covered are those of two efficient competitors. This will encourage companies to become more efficient in the face of the funding provided. As lines are lost to competition, the carrier will be forced to become more efficient, roll out new services and/or improve the revenue per line.

Issues that Need to be Addressed by a new Competitive Universal Service Task Force

A new Competitive Universal Service Task Force should be instituted to set the guidelines for the new modeling approach. One of the primary objectives of the new task force should be the determination of the specifications of the model for the FCC to adopt. In addition, this task force would address and recommend an approach on crucial but contentious issues, including:

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11. Current windfall arguments suggesting that wireless providers somehow receive a windfall from Universal Service appear to be based on a faulty premise: that the wireless provider has captured all (or at least a significant portion of) the total market. Basically, to receive a windfall, the competitive carrier would need to receive funding that brings its cost of service on a per customer basis to a level below the benchmark cost per line (plus the subsidy per line). Since the funding is provided to the competitor on a per-line basis, this requires significant market penetration. Additionally, windfall claims seem to indicate that the competing carrier's costs are less than incumbents. If this is the case, then the wireless competitor should be encouraged to enter the area and compete for lines from the less efficient higher cost incumbent. In actuality, windfalls for rural ILECs are currently more likely to occur since they now receive funding on the basis of their total embedded costs, regardless of which portion of the market they serve. Even if such a process does not result in a windfall for rural ILECs, it appears not to be competitively neutral.

- The level of funding for second (additional) lines, *e.g.*, funded to 100% of the level of first lines.
- The geographic area in which funding should be provided.
    - SubWirecenter or small geographic area funding.
- The value for the cost benchmark.
- The impact of technology and its integration into the model.
- Transition period from current funding levels to new funding levels.[12]
    - There is a tight balancing act given that existing carriers – both competitive carriers and ILECs -- built plant and offered service with an assumed "implicit contract" that they would be made whole on their prior investments. As such, some mechanism should be adopted to transition these existing carriers over to a competitive environment without any implied recovery promises.

12. One way to address this is to use a hold-harmless approach for some period of time to allow all carriers to adjust business strategies and processes to new anticipated funding levels.

Appendix A: CostQuest Capabilities and References

For the last 9 years, the CostQuest team has been at the forefront of Network and Universal Service Modeling. As demonstrated in Table 1, we are a solid team of telecommunications experts who have developed, deployed and supported Network, Loop, UNE and Universal Service models around the world.

Table 1—CostQuest Universal Service and Loop Modeling Experience

Model	Description
Cost Proxy Model ("CPM")	Retained by Pacific Telesis to develop new approach to Universal Service Cost modeling. Led design, development and implementation of one of the first network proxy models for Universal Service. Initial version was used internally and was first to use actual geocoded customer data. Generic version used Census data and was developed for the California Public Utility Commission. Model was approved and used to size and distribute the Universal Service fund in California. Model was adapted and populated to run the entire United States. Model was presented to FCC and licensed for use by a mid-size U.S. ILEC to determine its network cost.
CPM Hong Kong	Retained by Hong Kong Telecom to cost out existing network to develop, size and distribute Universal Service fund. All customer locations, routes, cable sizes, equipment types and locations were captured. Developed costs all the way down to each customer. Model was adopted by Hong Kong Regulatory Commission.
Benchmark Cost Proxy Model ("BCPM")	United States national platform for Universal Service. Led design, development and implementation under the auspices of U S West, BellSouth, and Sprint. Model has been adopted and is still in use in multiple U.S. states. Portion of the model was basis for components of the FCC's Synthesis Model.
BSTLM CostMap BSTLM-CostPro CostPro	Next Generation loop models. First loop models to combine geocoded customer location data with road data. First models to employ Minimum Spanning Road Tree ("MSRT") to realistically design telecommunications network. First models to capture cost of all loop based services. Model being used by two U.S. ILECs. Model has been approved for use in 7 states. Model supports both TSLRIC and TELRIC costing methodologies.

Net Universal Service Cost ("NUSC") model	Australian Universal Service Cost model. Captures cost of existing network based upon a sampling approach. Led the development and implementation of model. Model was adopted by the Australian Communications Authority ("ACA") to help determine the Universal Service funding in Australia.
FCC's Synthesis Model	Retained by U S West, Sprint and BellSouth to assist FCC develop national model. Provided extensive analysis, support and witnessing on the model.
New Zealand Core Network Model	Retained by the Commerce Commission of New Zealand to develop a replacement module of the Switching/Signaling/Transport component of the FCC's Synthesis Model. The Commission will combine the output of the FCC's HCPM loop model with the output of CostQuest's Core modeling efforts. Model will be used to determine the universal service funding in New Zealand.

Appendix B: Rural Task Force Synthesis Model Evaluation Criteria

The following criteria for evaluating proxy cost models provide a variety of methods for evaluating the applicability of proxy cost models for determining universal service support for Rural Carriers. Evaluation of these criteria will involve informed judgment; particularly in making determinations of whether there is "reasonable representation" or "reasonable comparability", standards that may have varying interpretations depending on the criteria under consideration. While the models should be evaluated in regard to each of the criteria, judgment will need to be exercised in determining the "sufficiency" of meeting the individual criteria and the overall balance of "sufficiently" meeting the criteria in total.

Model Structure

1. The model structure should be evaluated in relationship to the ten criteria established by the FCC in its Report and Order in CC Docket No. 96-45 (FCC 97-157) released May 8, 1997, paragraph 250.

2. The network "built" by the model reasonably represents a network that would be built in the real world by a telecommunications company to provide the same service levels and technology as assumed in the model.
   a. At a wire center level the physical location of the network that is built is reasonably within the confines of the actual wire center boundaries.
   b. At a wire center level the route mileage of plant built by the model is reasonably sufficient to serve the customer locations.
   c. Cluster locations for digital loop carriers are appropriately located so that the 18,000 foot maximum copper loop length is not exceeded using rights-of-way that are actually available.
   d. At the wire center level, calculated access line counts for residence and business customers are consistent with actual wire center access line counts, assuming that such wire center access line counts can be obtained.
   e. The type of outside plant built by the model (e.g. aerial, buried, or underground) is reasonably consistent with the type of plant actually being used in new construction in the study area.

3. There is consistency between the model structure and its use of inputs and the basis upon which the model inputs were developed.
   a. Assignment of specific network components to the model's density zones for cost development is consistent with the method used in developing the cost and other assumptions that vary based on those density zones.

Model Inputs

There is sufficient variability in model inputs to reflect cost differences reflected by forward-looking efficient rural companies with varying circumstances such as, geographic differences, cost of labor, purchasing power, geographic isolation, company size, etc.

a. Cost of cable reflects cost of cable purchased in both contract and work order quantities by companies with varying purchase discount capabilities and varying transportation cost requirements.
b. Cost of other purchased items reflects variations in cost encountered because of transportation costs, geographic location, and varying purchase discount capabilities.
c. Assumptions regarding the type of outside plant (e.g. aerial, buried, or underground) reflect the type of construction that is reasonably expected to be built in the location being modeled. Factors affecting the type of outside plant such as weather and geography will be reasonably reflected in plant construction type assumptions. Statutory and regulatory requirements affecting the type of outside plant will also be reflected unless specific policy determinations preclude giving these requirements consideration.
d. Structure sharing inputs will be reasonably consistent with construction methods that would be used for new construction of communications facilities in the specific area. When structure sharing is assumed, cost inputs for structures will reflect the cost of building structures that are consistent with sharing assumptions.
e. Expense inputs for such items as customer and corporate operations expenses will recognize the impact that company size has on these expenditures.

Model Outputs

Comparisons of model outputs to actual company data must be made with some care and specificity since network design features may differ from those in actual service and company functions modeled for universal service do not encompass the full range of functions actually performed in an operating company. Cost differences resulting from the historic age of actual plant also must be recognized in making such comparisons and in making judgments on the "reasonable comparability" of such information. Comparison of model results between companies are reasonably consistent with general expectations of relationships of costs for various cost components to such factors as density, size of the geographic area served, size of wire centers, and number of lines served.

1. Investment results produced by the model should be reasonably comparable to actual investment amounts in companies where the network elements in service are similar in technology and age to the network elements being modeled.

a. Outside plant investment results should be reasonably comparable to actual investment amounts in those companies or wire centers where the outside plant architecture has unloaded loops and digital loop carrier architecture with recent construction periods.
b. Central office switching investment results should be reasonably comparable to actual investment amounts in those companies that have digital switches with SS7 capabilities.
c. General support investment results (vehicles, general purpose computers, land, buildings, work equipment, furniture, etc.) should be reasonably comparable to

actual investment amounts, giving consideration to cost differences due to age and operational differences.

2. Expense results produced by the model should be reasonably comparable to actual expense amounts for similar functions being conducted by the company, or by a similarly situated company or companies, to those that are being modeled.

a. Modeled plant specific expense results should have reasonably similar relationships to modeled plant investment results as do existing plant specific expense and investment amounts.
b. Modeled customer operations expense results should be reasonably comparable to actual customer operations expense amounts for the functions being modeled.
c. Modeled corporate operations expense results should be reasonably comparable to actual corporate operations expense amounts for the functions being modeled.

Model Results

Comparison of model results between companies are reasonably consistent with general expectations of relationships of costs for various cost components to such factors as density, size of the geographic area served, size of wire centers, and number of lines served.