PART 63—[AMENDED]

1. The authority citation for part 63 continues to read as follows:

Authority: 42 U.S.C. 7401, et seq.

Subpart E—Approval of State Programs and Delegation of Federal Authorities

2. Section 63.99 is amended by revising paragraph (a)(3) to read as follows:

§ 63.99 Delegated Federal authorities.

(a) * * *

(3) *Arizona.* The following table lists the specific Part 63 standards that have been delegated unchanged to the air pollution control agencies in the State of Arizona. The (X) symbol is used to indicate each category that has been delegated.

DELEGATION STATUS FOR PART 63 STANDARDS—ARIZONA

Subpart	Description	ADEQ [1]	MCESD [2]	PDEQ [3]	PCAQCD [4]
A	General Provisions	X			X
F	Synthetic Organic Chemical Manufacturing Industry	X			X
G	Synthetic Organic Chemical Manufacturing Industry: Process Vents, Storage Vessels, Transfer Operations, and Wastewater.	X			X
H	Organic Hazardous Air Pollutants: Equipment Leaks	X			X
I	Organic Hazardous Air Pollutants: Certain Processes Subject to the Negotiated Regulation for Equipment Leaks.	X			X
L	Coke Oven Batteries	X			X
M	Perchloroethylene Dry Cleaning	X			X
N	Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks.	X			X
O	Ethylene Oxide Sterilization Facilities	X			X
Q	Industrial Process Cooling Towers	X			X
R	Gasoline Distribution Facilities	X			X
T	Halogenated Solvent Cleaning	X			X
U	Group I Polymers and Resins	X			X
W	Epoxy Resins Production and Non-Nylon Polyamides Production	X			X
X	Secondary Lead Smelting	X			X
CC	Petroleum Refineries	X			X
DD	Off-Site Waste and Recovery Operations	X			X
EE	Magnetic Tape Manufacturing Operations	X			X
GG	Aerospace Manufacturing and Rework Facilities	X			X
JJ	Wood Furniture Manufacturing Operations	X			X
KK	Printing and Publishing Industry	X			X
OO	Tanks—Level 1	X			X
PP	Containers	X			X
QQ	Surface Impoundments	X			X
RR	Individual Drain Systems	X			X
VV	Oil-Water Separators and Organic-Water Separators	X			X
JJJ	Group IV Polymers and Resins	X			X

[1] Arizona Department of Environmental Quality.
[2] Maricopa County Environmental Services Department.
[3] Pima County Department of Environmental Quality.
[4] Pinal County Air Quality Control District.

[FR Doc. 98–30722 Filed 11–17–98; 8:45 am]

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 36, 54 and 69

[CC Docket Nos. 96–45 and 97–160; FCC 98–279]

Federal-State Joint Board on Universal Service, Forward-Looking Mechanism for High Cost Support for Non-Rural Local Exchange Carriers

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this Order, we select a platform for the federal mechanism to estimate non-rural carriers' forward-looking cost to provide the supported services. The model platform we adopt combines the best elements from each of the three models currently in the record. The model platform we adopt will allow the Commission to estimate the cost of building a telephone network to serve subscribers in their actual geographic locations, to the extent known. To the extent that telephone companies cannot supply the actual geographic location of the customer, the model platform assumes that those customers are located near roads. The model also allows the Commission to adjust engineering assumptions to reflect any evolution in the definition of supported services, and to assure that the model assumes a network architecture that will not impede rural Americans' ability to use the internet and other advanced telecommunications and information services. As such, we believe the federal model platform we adopt will serve as a solid foundation for further decisions that will determine the amount of universal service support to be provided to non-rural eligible telecommunications carriers.

EFFECTIVE DATE: November 18, 1998.

FOR FURTHER INFORMATION CONTACT: Chuck Keller, Common Carrier Bureau, (202) 418–7400.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Fifth Report and Order in CC Docket Nos. 96–45 and 97–160, adopted October 22, 1998 and released October 28, 1998. The full text is available for inspection and copying during normal business hours in the FCC Reference Center (Room 239), 1919 M St., N.W., Washington, DC.

Summary of Fifth Report and Order in CC Docket Nos. 96–45 and 97–160

I. Overview

1. Since well before passage of the 1996 Act, the Commission has had in place policies to ensure the availability of telephone service in rural and high cost areas, as well as support mechanisms for low income consumers. Traditionally, consumers in high cost and rural areas of the nation have received universal service support through implicit subsidies in interstate and intrastate rates. Universal service has helped ensure that consumers in all parts of the country, even the most remote and sparsely populated areas, are not forced to bear prohibitively high rates in order to obtain phone service. Universal service also has been designed to ensure that low-income consumers have access to local phone service at reasonable rates. Long distance rates and rates for certain intrastate services have been priced above cost in many instances, in order to keep local telephone rates at affordable levels throughout the country. The universal service program has benefited all telephone subscribers throughout the country by helping to ensure that all Americans are connected to the network, and therefore telephonically accessible to one another. Universal service support has increased subscribership levels by ensuring that residents in rural and high cost areas are not prevented from receiving phone service because of prohibitively high local telephone rates. As of today, approximately 94 percent of the households in the United States subscribe to telephone service, a subscribership rate that is among the best in the world.

2. In the 1996 Act, Congress established a ''pro-competitive, de-regulatory national policy framework designed to accelerate rapidly private sector deployment of advanced telecommunications and information technologies and services to all Americans by opening up all telecommunications markets to competition.'' One of the principal goals of the telephony provisions of the 1996 Act is reforming universal service support so that the universal service objectives set forth in the 1996 Act continue to be met as local exchange and exchange access markets move from monopoly to competition. In the 1996 Act, Congress codified the Commission's long-standing commitment to ensuring universal service and directed that ''[c]onsumers * * * in rural, insular, and high cost areas should have access to 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 [those] in urban areas.'' The 1996 Act also directed the Commission to reform universal service support mechanisms to ensure that they are compatible with the pro-competitive goals of the 1996 Act. In requiring incumbents to open their local markets to competitive entry, Congress rendered unsustainable the existing universal service support system, which is based on a complex system of implicit and explicit subsidies. Rate structures that contain implicit support flows, such as artificially inflated interstate access charges and business rates, are sustainable in a monopoly environment but not in a competitive environment. Absent restructuring of the universal service system, competitors would enter markets where rates are artificially high relative to costs, and would not enter markets where rates are kept artificially low. Moreover, absent rate restructuring, such systematic market entry strategies would threaten to erode altogether the system of universal service. Incumbents would continue to have to serve the high cost customers without the offsetting benefit of the high-profit revenue streams that previously subsidized serving these high cost areas.

3. In order to sustain universal service in a competitive environment, Congress found: (1) that universal service support should be explicit; (2) that all carriers (rather than only interexchange carriers) that provide telecommunications service should contribute to universal service on a competitively neutral, equitable, and non-discriminatory basis; and (3) that, as a general matter, any carrier (rather than only the incumbent local exchange carrier) should be eligible to receive, on a competitively neutral, equitable, and non-discriminatory basis, the appropriate level of support for serving a customer in a high cost area.

4. In the *Universal Service Order,* 62 FR 32862 (June 17, 1997), the Commission adopted its plan to implement a system of universal service support for rural, insular, and high cost areas to replace the existing high cost programs and the implicit federal subsidies with explicit, competitively neutral federal universal service support mechanisms. The first steps were implemented on January 1, 1998. For instance, as of that date the new universal service rules require equitable and non-discriminatory contributions from all providers of interstate telecommunications service rather than exclusively from interstate long distance providers. Also, as of January 1, 1998, competitive eligible telecommunications carriers are also eligible to receive federal universal service support for serving customers in high cost, rural, and insular areas. This order, which adopts the platform of a federal mechanism that would allow support amounts to be determined based on forward-looking cost, is the first step towards further revisions of federal support mechanisms. This estimate will be used to determine the level of support provided to eligible non-rural telecommunications carriers, beginning July 1, 1999.

5. In the *Universal Service Order,* the Commission also agreed with the Joint Board that the appropriate level of federal universal service high cost support should be based on forward-looking economic cost rather than embedded cost. The Joint Board found that, for purposes of administering a federal high cost support system based on forward-looking cost, a forward-looking cost model would be an essential part of determining support levels in an efficient way. The Joint Board also found that determining costs with a cost model would provide other benefits, such as the ability to determine costs at smaller geographic levels than would be practical using the existing cost accounting system. By using a cost model, universal service support can be targeted to support the high cost customers within a carrier's service area. Moreover, a forward-looking economic cost mechanism eliminates incentives to invest inefficiently. Also, because all eligible carriers will receive the same level of support when they win a customer and because the level of support is not based on the specific technology that the carrier used to deliver the supported service, the new universal service mechanism will be competitively and technologically neutral. Finally, the use of a forward-looking cost model allows the Commission to ensure that universal service support amounts are based on a network that will provide the supported services and not impede the provision of advanced services. In contrast, a support system based on the existing network, which is in some cases of lower quality, would not provide sufficient support for necessary upgrades. Basing support on the forward-looking cost of a network that is capable of providing the supported services will ensure that universal service support is based on a network with the capacity to ensure service

quality and access to advanced services in rural areas.

6. In determining the appropriate level of high cost support, the Commission is committed to ensuring that ''[q]uality services [are] available at just, reasonable, and affordable rates,'' and that ''[c]onsumers * * * in rural, insular, and high cost areas, should have access to 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 charges for similar services in urban areas,'' as required by the statute. In agreeing with the Joint Board that forward-looking economic cost will provide sufficient support for an efficient carrier to provide the supported services for a particular geographic area, the Commission specifically rejected arguments that support should be based on a carrier's embedded cost. As the Joint Board recognized, providing support based on embedded cost provides the wrong signals to potential market entrants. If embedded costs exceed forward-looking costs, such support would encourage inefficient entry. In contrast, providing support based on embedded costs that are below forward-looking economic costs would dissuade market entry even where such competition would be economically efficient. The Commission concurred with the Joint Board's finding that the use of forward-looking economic costs as the basis for determining support will send the correct signals for entry, investment, and innovation. The Commission found that a forward-looking economic cost methodology creates the incentive for carriers to operate efficiently and tends not to give carriers an incentive to inflate their costs or to refrain from efficient cost-cutting.

7. As noted above, our process of estimating forward-looking costs is proceeding in two stages. Consistent with the Joint Board's recommendation, the Commission in the *Universal Service Order* concluded that it would need to estimate costs based on a careful analysis of efficient network design, engineering practices, available technologies, and current technology costs. That is, to estimate forward-looking costs accurately, the Commission decided to look at all of the costs and cost-causative factors that go into building a network. The Commission decided to do this in two stages: first, it would look at the network design, engineering, and technology issues relevant to constructing a network to provide the supported services. Second, the Commission said that it would look at the costs of the components of the network, such as cabling and switch costs, and various capital cost parameters, such as debt-equity ratios and depreciation rates (''input values'').

8. This Order includes our conclusions as to the platform selection, the first of the two stages. In the *Universal Service Order,* the Commission concluded that two industry-proposed cost models should continue to be considered and developed further and stated that it might also consider models or model components submitted by other parties or developed by Commission staff. Both of the industry-proposed models have improved in significant ways since the *Universal Service Order* was adopted, and Commission staff has developed a separate model. Below we adopt a synthesis of the best aspects of each of the three models before us in this proceeding. We recognize that, of necessity, models estimate the forward-looking cost of providing the supported services. Such analysis is, however, the only practicable method that presently exists for determining forward-looking costs on a widescale basis, and we expect that the synthesis model will generate accurate estimates of the forward-looking of providing the supported services. The federal mechanism that we select in this Order to estimate forward-looking cost will serve as the foundation for determining the final universal service support requirements. The Commission intends to issue Orders on the input values to be used in the selected mechanism and the further recommendations of the Joint Board in time to implement the federal mechanism for non-rural carriers by July 1, 1999. Because inputs are critical to determining the cost of providing the supported services, the Order we adopt today does not identify the amount of high cost support that will be provided to non-rural carriers beginning July 1, 1999. The selected platform alone is not dispositive of the cost calculations generated by the mechanism. That determination also depends upon the selection of input values and the resolution of the issues recently referred back to the Joint Board, such as benchmark levels. Moreover, we note that the selection of the synthesis platform is based solely on our evaluation of its performance for determining non-rural carriers' forward-looking costs for universal service purposes. We have not evaluated it for any other purpose.

9. We recognize that the task of establishing a model to estimate forward-looking costs is a dynamic process that will need to be reviewed and adjusted periodically. We must balance the needs to provide predictability and certainty with the need to account for changes that inevitably will occur over time, such as technological advances. For example, a party recently submitted data in support of basing support on the use of wireless technologies in some instances. The Commission therefore intends, before the end of this year, to begin more detailed consideration of possible future modification of the model to reflect new technologies. Among other things, the Commission may consider how the model should be updated in the future to account for changes in material prices, technology, and other circumstances. We also will address issues related to the administration of high cost support, including the transition by which routine use of the model and updating of model data will be provided by the administrator of universal service support mechanisms, subject to Commission oversight. In addition, we expect that, both before we implement the model for non-rural carriers on July 1, 1999, and on an ongoing basis, we will find opportunities to make technical improvements. In such cases, we delegate to the Common Carrier Bureau the authority to make changes or direct that changes be made as necessary and appropriate to ensure that the platform of the federal mechanism operates as described in this Order.

II. Procedural History

A. Universal Service Order

10. Prior to the 1996 Act, three explicit universal service programs were in place to provide assistance to small incumbent local exchange carriers (LECs) and LECs that served rural and high cost areas: high cost loop support, dial equipment minutes (DEM) weighting, and the Long-Term Support program. Other mechanisms also have historically contributed to maintaining affordable rates in rural areas, including subsidies implicit in intrastate rates and interstate access charges. Section 254 required the Commission to institute a Federal-State Joint Board on universal service and implement the recommendations from the Joint Board by May 8, 1997. After receiving the recommendations of the Joint Board, the Commission adopted the *Universal Service Order.*

11. In the *Universal Service Order,* the Commission adopted a forward-looking economic cost methodology for non-rural carriers that will calculate support in four steps. First, a forward-looking

economic cost mechanism selected by the Commission, in consultation with the Joint Board (federal mechanism), would be used to calculate non-rural carriers' forward-looking economic cost of providing the supported services in high cost areas. Second, the Commission would establish a nationwide benchmark that represents the revenue that carriers receive as a result of providing service. Third, the Commission would calculate the difference between the forward-looking economic cost and the benchmark. Fourth, federal support would be 25 percent of that difference, corresponding to the percentage of loop costs that historically has been allocated to the interstate jurisdiction. In the *Universal Service Order,* the Commission stated that, once states have taken steps to identify the subsidies implicit in intrastate rates, the Commission may reassess the amount of federal support that is necessary to achieve the Act's goals. In response to issues raised by commenters and the state Joint Board members, the Commission referred back to the Joint Board questions related to how federal support should be determined. For example, the Joint Board is reviewing how best to determine the support amount, given the forward-looking cost of providing the supported services in an area, and the appropriate share to be provided by the federal mechanism. Although many of the proposals under consideration by the Joint Board and pending before the Commission on reconsideration might alter some of those four steps, the proposals would generally still require the Commission to adopt a mechanism for determining the forward-looking cost of providing the supported services.

12. In the *Universal Service Order,* the Commission concluded that two industry-proposed models, the HAI Model and the Benchmark Cost Proxy Model, that had been submitted for consideration in the proceeding that led up to the *Order* were not sufficiently accurate for adoption as the federal cost mechanism, but that the two models should continue to be considered and developed further.

13. The Commission stated that it might consider, for the federal mechanism, alternative algorithms and approaches submitted by parties other than the model sponsors or that could be generated internally by Commission staff. The Commission noted that one possible outcome of this approach would be development of a hybrid or synthesis model that combines selected components of different models with additional components and algorithms drawn from other sources. The Commission presently has three models before it: (1) the Benchmark Cost Proxy Model, Version 3.0 (BCPM); (2) the HAI Model, Version 5.0a (HAI); and (3) the Hybrid Cost Proxy Model, Version 2.5 (HCPM).

B. Further Notice and the Model Development Process

14. In a July 18, 1997 *Further Notice of Proposed Rulemaking (Further Notice),* 62 FR 42457 (August 7, 1997), the Commission established a multi-phase plan to develop a federal mechanism that would send the correct signals for entry, investment, and innovation. The *Further Notice* divided questions related to the cost models into ''platform design'' issues and ''input value'' issues. The *Further Notice* subdivided the platform issues into four topic groups, and sought comment on each group separately in order to develop a focused dialogue among interested parties. The four groups were: (1) customer location platform issues; (2) outside plant design platform issues; (3) switching and interoffice platform issues; and (4) general support facilities, expenses, and all inputs issues.

15. In the *Further Notice,* we also requested that parties provide information about the platform design and input values that would allow the mechanism developed in this proceeding to estimate the forward-looking cost of non-rural carriers in Alaska and insular areas. In addition, the Commission indicated in the *Further Notice* that, in selecting a federal mechanism, we might consider alternative approaches to BCPM and HAI, such as the development of a hybrid model that combines components of BCPM or HAI with each other or with algorithms drawn from other sources. After reviewing the comments received in response to the *Further Notice,* the Common Carrier Bureau released two public notices as guidance to parties wishing to submit cost models for consideration as the federal mechanism. The Bureau's guidance provided recommendations on the platform design of the customer location, outside plant, switching, and transport components of a cost model.

16. During the course of the model development process, proponents of BCPM and HAI submitted a series of revisions to model components and intermediate output data. In a *Public Notice* released on November 13, 1997, the Bureau requested that model proponents by December 11, 1997 submit versions of their model platforms that incorporated the Bureau's guidance. The Bureau stated its expectation that the Commission would evaluate the models submitted at that time to select the platform for the federal mechanism. Updated versions of BCPM, HAI, and HCPM were filed with the Commission on December 11, 1997. On August 7, 1998, HCPM released a clustering algorithm to group customers into serving areas. The Bureau has continued to receive minor refinements to all three models.

C. Design of a Forward-Looking Wireline Local Telephone Network

17. To understand the assumptions made in the models, it is necessary to understand the layout of the current wireline local telephone network. In general, a telephone network must allow any customer to connect to any other customer. In order to accomplish this, a telephone network must connect customer premises to a switching facility, ensure that adequate capacity exists in that switching facility to process all customers' calls that are expected to be made at peak periods, and then interconnect that switching facility with other switching facilities which routes the call to its destination. A ''wire center'' is the location of a switching facility, and there are geographic boundaries that define the area in which all customers are connected to a given wire center. By requiring the models to use existing incumbent LEC wire center locations, the *Universal Service Order* imposed some uniformity in the models' network design.

18. Within the boundaries of each wire center, the wires and other equipment that connect the central office to the customers' premises are known as *outside plant.* Outside plant can consist of either copper cable or optical fiber cable or a combination of optical fiber and copper cable, as well as associated electronic equipment. Copper cable generally carries an analog signal that is compatible with most customers' telephone equipment, but thicker, more expensive cables must be used to carry signals over greater distances. Optical fiber cable carries a digital signal that is incompatible with most customers' telephone equipment, but the quality of the signal degrades significantly less with distance compared to a signal carried on copper wire. Generally, when a neighborhood is located too far from the wire center to be served with copper cables alone, an optical fiber cable will be deployed to a point within the neighborhood, where a piece of equipment will be placed that converts the digital signal carried on optical fiber cable to an analog, electrical signal that is compatible with

customers' telephones. This equipment is known as a digital loop carrier remote terminal, or DLC. Because of the cost of DLCs, the models are designed so that a single DLC is shared among a number of customers. From the DLC, copper cables of varying gauge extend to all of the customer premises in the neighborhood. Where the neighborhood is close enough to the wire center to serve entirely on copper cables, a copper trunk connects the wire center to a central point in the serving area, called the serving area interface (SAI), and copper cables will then connect the SAI to the customers in the serving area. The portion of the loop plant that connects the central office with the SAI or DLC is known as the ''*feeder*'' *plant,* and the portion that runs from the DLC or SAI throughout the neighborhood is known as the ''*distribution*'' *plant.*

19. A model's estimate of the cost of serving the customers located within a given wire center's boundaries includes the model's calculation of switch size, the lengths, gauge, and number of copper and fiber cables, and the number of DLCs required. These factors depend, in turn, on how many customers the wire center serves, where the customers are located within the wire center boundaries, and how they are distributed within neighborhoods. Particularly in rural areas, some customers may not be located in neighborhoods at all but, instead, may be scattered throughout outlying areas. In general, the models divide the area served by the wire center into smaller areas that will be served from a single DLC, known as ''*serving areas.*'' All cable within a serving area, with the exception of that which connects a DLC to a central office, is considered distribution plant.

20. The model proponents agree that forward-looking design requires that wire centers be interconnected with one another using optical fiber networks known as Synchronous Optical Network (SONET) rings. The infrastructure to interconnect the wire centers is known as the ''interoffice'' network, and the carriage of traffic among wire centers is known as ''*transport.*'' In cases where a number of wire centers with relatively few people within their boundaries are located in close proximity to one another, it may be more economical to use the switching capacity of a single switch to process the calls of the customers in the boundaries of all the wire centers. In that case, a full-capacity switch (known as a ''host'') is placed in one of the wire centers and less expensive, more limited-capacity switches (known as ''remotes'') are placed in the other wire centers. The remotes are then connected to the host with interoffice facilities. Switches that are located in wire centers with enough customers within their boundaries to merit their own full-capacity switches and that do not serve as hosts to any other wire centers are called ''stand-alone'' switches.

21. The models under consideration in this proceeding differ in several important ways in estimating the forward-looking cost of designing a telephone network. For example, the three models in this proceeding rely on different sets of data and assumptions to ascertain the number of customers in each wire center and the geographic location of those customers. The models also use different methods to calculate switch size, the size, type, and number of fiber and copper cables, and the routing of those cables.

III. Customer Location and Outside Plant Design

22. We first consider the customer location and outside plant algorithms of BCPM, HAI, and HCPM in light of the criteria identified in the *Universal Service Order.* As the Bureau pointed out in the *Outside Plant Public Notice,* the criteria suggest that the models ''should be considered both from an engineering perspective, to ensure that the network provides the type and quality of service specified in the *[Universal Service] Order,* and from an economic perspective, to ensure that the network design minimizes costs and maximizes efficiency.'' We conclude that the customer location and outside plant platform of the federal mechanism should consist of a synthesis of the best ideas presented by the model proponents, including HAI's use of geocoded customer location data, BCPM's use of the road network to estimate the locations of customers for whom no geocode data are available, HCPM's approach to identifying customer serving areas based on natural clusters of customers, and HCPM's ability to design plant to the precise customers locations within each serving area.

A. Discussion

23. In this section, we identify the combination of data and algorithms that locate customers and design outside plant to serve those customers in a way that best meets the criteria identified in the *Universal Service Order.* As an initial matter, we observe that all three models design a network that is capable of providing the supported services. We also conclude, as explained below, that each of the models meets a reasonable standard for ensuring that the network designed does not impede the provision of advanced services.

24. We identify five distinct aspects of the customer location and loop design portions of a cost model that can have a significant bearing on the model's ability to estimate the least-cost, most-efficient technology for serving a particular area. These include: (i) the extent to which the model uses actual customer location data to locate customers, (ii) the method of determining customer locations in the absence of actual data, (iii) the algorithms employed to group customers into serving areas, (iv) the model's ability to design plant directly to the customer locations within the serving area, and (v) adherence to sound engineering and cost minimization principles in both the design of distribution plant within each serving area and the design of feeder plant to connect each serving area to the associated central office.

1. Determining Customer Location

25. Each model has a method for determining where customers are located. The issues raised are whether to use actual geocode data, to the extent they are available, and what method to use for determining surrogate customer locations where geocode data are not available. We conclude that HAI's proposal to use actual geocode data, to the extent that they are available, is the preferred approach, and BCPM's proposal that we use road network information to determine customer location where actual data are not available, provides the most reasonable method for determining customer locations.

26. The starting point that all three models use in determining customer location is publicly available information from the Census Bureau, which provides the number of customers within each Census Block (CB). Thus, at a minimum, each model has information about the number of customers within a specified geographic area. In urban areas, CBs tend to be relatively small, and often contain only one city block. In rural areas, however, CBs typically are much larger. It is therefore important to have a reasonable method for determining customer locations more precisely within the CB.

27. *Use of Geocode Data.* Only HAI includes a specific proposal for using actual latitude and longitude data to identify customer locations. Many commenters from across the spectrum of the industry agree that geocode data that identify the actual geographic locations of customers are preferable to algorithms intended to estimate

customer locations based solely on such information as Census data. We agree with Ameritech that proxy techniques for estimating customer locations are unnecessary and inappropriate for companies that can identify the actual customer dispersion of their customers with geocode data. We conclude that a model is most likely to select the least-cost, most-efficient outside plant design if it uses the most accurate data for locating customers within wire centers, and that the most accurate data for locating customers within wire centers are precise latitude and longitude coordinates for those customers' locations.

28. Recent public comment demonstrates support for the use of accurate geocode data in the federal mechanism when available. At present, the only geocode data in the record of this proceeding are those prepared for the HAI model by the HAI sponsors' consultants, PNR Associates (PNR). Many commenters recognize that, in addition to the current sources of geocode data, more comprehensive geocode data are likely to be available in the future. Nevertheless, some commenters still question whether PNR's geocode data set should be used in the federal mechanism. We note that our conclusion that the model should use geocode data to the extent that they are available is not a determination of the accuracy or reliability of any particular source of that data. We anticipate, however, that a reasonable source of verifiable geocode data can be determined at the inputs stage of this proceeding. At a minimum, PNR's data is now available for review, and interested parties may comment upon and suggest improvements to the accuracy of that database. Thus, while we conclude that the federal mechanism should use geocode data to the extent available, we do not in this Order adopt a particular source of geocode data. The final choice of what source or sources of geocode data to use in determining customer location will be decided at the inputs phase of this proceeding.

29. We also conclude that the federal mechanism should not discard geocode data in favor of surrogating below some ''break point'' percentage in each CB. The BCPM sponsors contend that actual geocode data should be used in conjunction with surrogate data only when the percentage of customer locations in a given area for whom precise geocode data are known is above 80 percent. The BCPM sponsors suggest that the combined use of actual and surrogate customer locations below this threshold will lead to clusters with ''unnatural distributions.'' The BCPM sponsors have provided no concrete evidence or statistical support for their position that significant anomalies will result from mixing actual and surrogate geocode points, nor provided adequate justification for the proposed level of the break point. We find that actual geocode data, to the extent available, provide the most reliable customer location information. BCPM has not persuaded us that geocode data should be discarded simply because the available geocode data for a given area may be limited. We therefore decline to adopt BCPM's suggestion that the model use surrogate geocode data in instances where only low percentages of actual geocode data are available.

30. *Surrogate Location Methodology.* Where actual customer location information is unavailable, the models must use other means to identify customer locations. Each model has developed a method for determining the location of customers in the absence of geocoded customer location data.

31. In the absence of geocoded customer data, HAI distributes all ''surrogate'' customers uniformly around the boundaries of a CB. The HAI proponents contend that this distribution results in a conservative placement of customers because it assumes they are maximally separated from one another.

32. BCPM uses CB data and a grid approach that allocates customers to micrograms using road network data, based on the assumption that customers are located along roads. The BCPM proponents argue that many roads lie in the interior of CBs, not just along CB boundaries, and that customer location correlates with roads. Information about the correlation between ''road mileage'' and ''housing units'' presented by the BCPM proponents for the state of Kentucky suggests that customers tend to live near roads. BCPM also notes that most rights of way follow roads.

33. In the absence of geocode data, HCPM locates customers based on CB-level data by assuming that customers are distributed evenly across a square grid cell with the same area as the average size of a CB in the wire center.

34. Recent comments in this docket support the use of road network to place surrogate customer locations. We conclude that, in the absence of precise customer location data, BCPM's rationale of associating road networks and customer locations provides the most reasonable approach in determining customer locations. We find that BCPM's assumption that customers generally live along roads is reasonable. Moreover, we find that BCPM's method of associating customers with the distribution of roads is more likely to correlate to actual customer locations than uniformly distributing customers throughout the CB, as HCPM proposes, or uniformly distributing customers along the CB boundary, as HAI proposes. HCPM's surrogating method, for example, would be more likely than the other two models to locate customers in uninhabitable areas such as bodies of water or national parks. As BCPM notes, HAI's surrogating method might well associate customer locations in ditches, bodies of water, or other uninhabitable areas that may constitute CB boundaries. Moreover, HAI's method of placing surrogate locations along CB boundaries may result in the identification of false customer clusters, as surrogates from adjoining CBs are placed near one another along the common CB boundary. In addition, we note that BCPM has taken steps to identify and exclude certain types of roads or road segments that are unlikely to be associated with customer locations. We also note that the proponents of HAI have recently proposed a road surrogate methodology premised on the rationale that customers locations correspond to roads. Therefore, we adopt BCPM's proposal to use road network information as the basis for locating within a CB boundary customers whose precise locations are unknown.

35. We adopt BCPM's set of guidelines for excluding from the surrogating process the types of roads and road segments (such as interstate highways, bridges, and on- and off-ramps) that are unlikely to be associated with customer locations. Beyond these conclusions, we do not select a particular algorithm in this Order for placing surrogate points along roads. We conclude that the selection of a precise algorithm for placing road surrogates pursuant to these conclusions should be conducted in the inputs stage of this proceeding as part of the process of selecting a geocode data set for the federal mechanism.

2. Algorithms Employed to Group Customers Into Serving Areas

36. Once customer locations have been identified, each model must determine how to group and serve those customers in an efficient and technologically reasonable manner. A model will most fully comply with the criteria in the *Universal Service Order* if it uses customer location information to the full extent possible in determining how to serve multiple customers using a single set of electronics. Moreover, the model should strive to group customers

in a manner that will allow efficient service. As discussed below, we conclude that a clustering approach, as first proposed by HAI in this proceeding, is superior to a grid-based methodology in modeling customer serving areas accurately and efficiently. In addition, we conclude that the federal high cost mechanism should use the HCPM clustering module.

37. The model proponents have identified two methods—clustering and gridding—for grouping customers into serving areas. HAI identifies groups of customers based on their proximity to one another to create ''clusters'' of customers. HAI defines a ''serving area'' as a main cluster and those outlier clusters in close proximity. BCPM determines serving areas by means of a multi-step process that begins by placing grids over a map of CBs that make up a wire center. Once the grids are populated with customer location data, serving areas are determined based on technological limitations such as the number of lines that can be served from a single DLC. Although it originally proposed a gridding approach, HCPM subsequently developed a clustering algorithm.

38. To meet the *Universal Service Order's* criteria, a clustering algorithm should group customer locations into serving areas in an efficient manner to minimize costs while maintaining a specified level of network performance quality. This is consistent with actual, efficient network design. In other words, an efficient service provider would design its network using the most efficient method of grouping customers, in order to minimize costs.

39. The advantage of the clustering approach to creating serving areas is that it can identify natural groupings of customers. That is, because clustering does not impose arbitrary serving area boundaries, customers that are located near each other, or that it makes sense from a technological perspective to serve together, may be served by the same facilities. There are two main engineering constraints that must be accounted for in any clustering approach to grouping customers in service areas. Clustering algorithms attempt to group customers on the basis of both a distance constraint, so that no customer is farther from a DLC than is permitted by the maximum distance over which the supported services can be provided on copper wire, and on the basis of the maximum number of customers in a serving area, which depends on the maximum number of lines that can be connected to a DLC remote terminal.

40. In contrast, the chief advantage of the gridding approach is its simplicity. Placing a uniform grid over a populated area, and concluding that any customers that fall within a given grid cell will be served together, is simpler to program than an algorithm that identifies natural groupings of customers. The simplicity of the grid-based approach, however, can generate significant artificial costs. Because a simple grid cannot account for actual groupings of customers, grid boundaries may cut across natural population clusters. Serving areas based on grids may therefore require separate facilities to serve customers that are in close proximity, but that happen to fall in different grids. The worst-case scenario would involve a natural cluster of customers that, given distance and engineering constraints, could be served as a single serving area but that happened to be centered over the intersection of a set of grid lines. This would result in the division of the natural population cluster into four serving areas instead of one. As a result, a gridding approach cannot reflect the most cost-effective method of distributing customers into serving areas. In order best to meet the *Universal Service Order's* criteria, we conclude that the federal mechanism should use a clustering methodology, rather than a grid-based methodology, to determine serving areas.

41. Having determined that a clustering approach should be used, we must determine which clustering approach to adopt for use in the federal mechanism. Two types of clustering algorithms have been proposed in this proceeding, agglomerative and divisive. The HAI clustering algorithm is a ''nearest neighbor'' algorithm, a type of agglomerative approach, which forms clusters by joining customer locations to the nearest adjacent location in a sequential fashion. The HCPM sponsors have developed a divisive algorithm that they describe as tending ''to create the smallest number of clusters and is also by far the most efficient algorithm in terms of computer run-time.''

42. The agglomerative approaches to clustering, including the HAI nearest neighbor algorithm, work as follows. Initially, each location constitutes its own individual cluster. This initial state is modified by merging the two closest clusters together, reducing the total number of clusters by one. This modification is repeated until merging is no longer feasible from an engineering standpoint. In the HAI nearest-neighbor algorithm, distance is measured from the two customer locations that are closest together. The HAI nearest-neighbor method contains an additional constraint that no customer locations are joined if the distance between them is more than two miles.

43. In the divisive approach advocated by HCPM, all customer locations initially are grouped in a single cluster. If one or more engineering constraints are violated, the original cluster is divided into a new ''parent'' cluster and a ''child'' cluster. Customer locations are added to the child cluster until it is full, i.e., until no more locations can be added without violating the line count and maximum distance constraints. This process continues until the original cluster has been subdivided into a set of clusters that conform to the line count and maximum distance constraints.

44. The clustering module developed by the HCPM sponsors includes several optimization routines that seek to lower the cost of constructing distribution areas by reassigning certain customer locations to different clusters. One routine, called ''simple reassignment,'' reassigns a customer location to a different cluster if the location is closer to that cluster's center. The routine operates sequentially, taking account of both the maximum distance and line count constraints. After the reassignment, cluster centers are re-computed and the routine is repeated. The process continues until no more reassignments can be made. The second routine, called ''full optimization,'' considers customer locations one by one. It measures the effect each customer location has on the location of cluster centers, and moves a location from one cluster to another if the total distance from all customer locations to their cluster centers is reduced. The routine moves the customer location that gives the most distance reduction at each step. It continues until no more distance reduction is possible.

45. While some commenters express concern that the HCPM clustering algorithm has not undergone extensive review, most agree that the HCPM clustering algorithm introduces innovations and improvements over previous models. For example, Bell Atlantic notes that HCPM's ability to limit redistribution of customers from their geocoded locations by assigning them to small microgrids is a substantial improvement over the approaches of HAI and BCPM. GTE contends that the HCPM clustering algorithm is a significant improvement over the HAI clustering approach.

46. While we are cognizant of the concern expressed by commenters that the HCPM clustering algorithm has been available for review for a more limited time than the HAI clustering algorithm,

we note that the HCPM clustering algorithm and test data have been made available for public comment. Commission staff have met with and discussed issues relating to HCPM with the model sponsors and interested parties. The BCPM sponsors have performed an initial analysis of the HCPM clustering algorithm and while they suggest certain improvements to the HCPM clustering algorithm, no major flaw has been identified. Moreover, we observe that clustering algorithms, including in particular the divisive algorithm that HCPM employs, are a generally accepted and thoroughly tested part of statistical theory.

47. We find that the HCPM clustering algorithm provides the least-cost, most-efficient method of grouping customers into serving areas. The HCPM clustering algorithm tends to create the smallest number of clusters and is more efficient in terms of computer run-time. The divisive algorithm has greater ability to minimize costs while conforming to technological constraints and network quality standards. By considering at all times the most efficient assignment of a customer to a particular cluster, HCPM's divisive clustering algorithm ensures that customers will be served at the least cost possible. In establishing the least-cost, most-efficient method of grouping customers into serving areas, we note that fixed costs (i.e., those that do not vary with the number of lines) associated with DLC terminal devices in serving areas militate in favor of selecting an algorithm that generates a small number of large clusters rather than a larger number of small clusters. On the other hand, with a small number of clusters, the average distance of a customer from a central point of a cluster, and consequently the variable costs associated with cable and structures, tends to be greater than it would be if there were more clusters. In low-density rural areas, it is likely that fixed costs will be the most significant cost driver. Consequently, a clustering algorithm such as HCPM's that generates the smallest number of clusters should provide the least-cost, most-efficient method of determining customer serving areas in rural areas. In addition, a practical advantage of the divisive algorithm is that it runs in a small fraction of the time required for the agglomerative approaches. Hence it is more compatible with the criterion that the model platform be available for review. Therefore, we conclude that HCPM's clustering algorithm is superior to alternative algorithms designed to group customers into serving areas and adopt it for use in the federal mechanism.

3. Outside Plant Design

In designing outside plant, a model will most fully comply with the *Universal Service Order's* criteria if it designs a network that reflects as accurately as possible the available data on customer locations, adheres to sound engineering and forward-looking, cost-minimizing principles, and does not impede the provision of advanced services. We conclude that HCPM's outside plant design algorithms best meet the criteria developed in the *Universal Service Order,* including the requirement that the technology assumed in the model is the ''least-cost, most-efficient, and reasonable technology for providing the supported services.'' We therefore conclude that the federal mechanism should incorporate HCPM's outside plant design algorithm.

a. Designing Plant to Customer Locations

49. We first consider the manner in which each of the models designs outside plant once customer location and serving areas have been identified. After selecting a model that determines customer locations as accurately as possible and identifies efficient serving areas, it is important that the model design a network that takes the greatest advantage of that information. Thus, the model's method of designing outside plant should provide the best estimation of the design of outside plant to customer locations.

50. The HCPM loop design modules build loop plant directly to individual microgrids in which customers are located. The micrograms that HCPM is able to design closely reflect the underlying customer locations. If an accurate source of geocoded customer locations is used, the model is capable of building plant directly to every customer location with an error of no more than a few hundred feet for any individual customer.

51. By contrast, HAI and BCPM design outside plant by modifying the distribution areas so that they have square or rectangular dimensions and relocating customers so that they are distributed uniformly within the distribution area. In doing so, HAI and BCPM discard or distort customer location data. For example, although BCPM initially locates customers based on road network information, these customers are subsequently relocated into a square distribution area that is smaller than the quadrant in which the road network containing these customers is located. HAI's approach of designing plant to simplified customer locations within rectangularized serving areas, instead of to actual customer locations, could result in a systematic underestimation of outside plant costs. Sprint has observed that HAI's simplification of actual clusters to rectangles can result in an underestimation of plant costs. Sprint has shown that, under certain circumstances, HAI's conversion of actual clusters into rectangular distribution areas results in a shorter maximum cable length—and thus a lower cost of service—within the rectangularized cluster than in the actual, underlying cluster. Commission staff analysis has also revealed that HAI's approach to distributing customers evenly within its rectangularized serving areas can also result in a systematic underestimation in less dense areas when compared to the cost of constructing plant to serve the underlying customer locations within the clusters. BCPM's approach of designing plant to square customer serving areas that are significantly smaller than the areas over which the customers are actually distributed is likely to have similar infirmities.

52. The HAI model also sacrifices accuracy by assuming that customers are dispersed uniformly within its distribution areas. As a result, the boundaries of HAI's distribution areas are unlikely to correlate exactly with the boundaries of the clusters, so some customers located inside a cluster may be shifted beyond the boundaries of that cluster. Commenters have criticized this ''squaring up'' of cluster areas to create distribution areas, as well as the assumption that customers are uniformly distributed throughout the distribution area. We agree that inaccuracies may be introduced by modifying the geographical boundaries of distribution areas and the location of customers within those areas for purposes of constructing outside plant.

53. The models also have other elements that help ensure that an adequate amount of plant is constructed. For example, all three models categorize the terrain where plant is being built based on factors that affect the difficulty of building plant, such as soil type, depth to bedrock, and slope. HAI uses multipliers to reflect increased costs in areas with difficult terrain. BCPM uses separate structure cost tables for each of three terrain categories to reflect higher cost in more difficult areas. HCPM incorporates BCPM's approach. We find that the federal model should account for terrain factors in determining structure costs.

For the reasons stated elsewhere in this Order, we conclude that the federal platform should employ HCPM's outside plant algorithms, which take terrain factors into account in determining the cost of outside plant.

54. Thus, both BCPM and HAI, by relocating customers so as to distribute them uniformly in square or rectangular distribution areas, create an apparent systematic downward bias in the required amount of distribution plant that is constructed in less dense areas. In contrast, HCPM's outside plant design algorithm is capable of designing plant directly to, or very nearly to, precise customer locations and thus should generate estimates of distribution plant that are sufficient to reach actual customer locations. HCPM therefore has a significant advantage in estimating sufficient outside plant over HAI and BCPM in its ability to avoid the distortions associated with adjusting customer locations to establish square or rectangular distribution areas. This is particularly important for ensuring that the federal mechanism estimates the cost of a sufficient amount of plant. By designing plant to serve actual customer locations instead of simplified representations of customer locations, HCPM is substantially more likely to estimate the correct amount of plant necessary for providing the supported services. As a result, HCPM's outside plant cost estimates are likely to reflect more accurately the forward-looking cost of providing the supported services and thus comport more fully with the *Universal Service Order's* criteria.

b. Cost Minimization Principles

55. We conclude that the outside plant module should be able to perform optimization routines through the use of sound network engineering design to use the most cost-effective forward-looking technology under a variety of circumstances, such as varying terrain and density. Each of the three model proponents has made some effort to consider alternative plant designs and select the most economical approach, or to place limits on investment in certain circumstances in order to control costs. The ability of a model to perform optimization routines is a significant factor in its ability to estimate the least-cost, most-efficient technology under a variety of conditions, as the first criterion in the *Universal Service Order* requires. For example, assuming that the price of fiber cable or DLC electronics continues to drop, an optimizing model might shift the mix of fiber and analog copper towards fiber and away from copper.

56. HAI and BCPM have made efforts to incorporate cost minimization principles into their respective approaches. Both models permit main feeder routes to be angled towards areas of population concentration in order to reduce feeder costs. BCPM also economizes the cost of DLC equipment in the central office by connecting multiple DLC remote terminals with a single central office terminal where possible, and limits distribution investment by limiting total distribution plant within a distribution area to the total road distance in the area. In HAI, for feeder plant that is less than 9,000 feet in length, the model chooses between fiber or copper cable technologies based on life-cycle cost minimization. In determining plant mix, HAI also can choose between aerial and buried plant based in part on the alternative with the lower life-cycle cost. We have concerns, however, that the effectiveness of these cost minimization principles are tempered by their practicality in actual use. For example, the angling of feeder routes toward population centers without regard to considerations such as rights of way may lead to significantly lower cost estimates than are practicable in reality. More importantly, however, neither HAI nor BCPM would recompute the type of technology deployed in response to a change in relative input prices, a key feature of ensuring that costs are minimized, subject to technological and service quality constraints.

57. In contrast, HCPM selects the optimal type, number, and placement of DLCs, which are sized based on the number of lines served. For example, in a distribution area with 400 lines, HCPM would determine, based on input values for equipment prices, whether it is more economical to place one DLC with a maximum capacity of 500 lines or two DLCs each with a maximum capacity of 250 lines. HCPM also considers the relative costs of placing various feeder technologies (fiber or T–1 on copper) and selects the most economical technology. HCPM further selects the lowest relative cost of different feeder routings.

58. HCPM uses an algorithm developed for network planning purposes in both its feeder and distribution segments. This algorithm selects a feeder or distribution routing network by weighing the relative benefits of minimizing total route distance (and therefore structure costs) and minimizing total cable distance (and therefore cable investment and maintenance costs.) HCPM also selects technologies (e.g., fiber vs. copper, aerial vs. buried) on the basis of annual cost factors that account for both operating expenses and capital expenses over the expected life of the technology.

59. In reviewing the current models, we conclude that HCPM's explicit optimization routines are superior to those in BCPM and HAI. In addition, because the platform that we adopt for the federal mechanism may be in place for a significant time period during which relative costs may change, the impact of optimization may increase in importance over time.

60. We do not agree, as some parties have argued, that the models' outside plant design parameters should be verified by comparing the design of the model networks in specific locations to the design of incumbent LECs' existing plant in those locations in all cases. While we recognize that certain factors such as terrain, road networks, and customer locations are fixed, the design of the existing networks under these conditions may not represent the least-cost, most-efficient design in some cases. The Commission, in the *Universal Service Order,* adopted the Joint Board's recommendation that universal service support should be based on forward-looking economic costs. Existing incumbent LEC plant is not likely to reflect forward-looking technology or design choices. Instead, incumbent LECs' existing plant will tend to reflect choices made at a time when different technology options existed or when the relative cost of equipment to labor may have been different than it is today. Incumbent LECs' existing plant also was designed and built in a monopoly environment, and therefore may not reflect the economic choices faced by an efficient provider in a competitive market. Although we do not believe that a forward-looking platform can meaningfully be verified by comparing its network to an embedded network, we note that the platform is only one of many considerations used to set actual levels of support.

c. Service Quality

61. The *Universal Service Order's* first criterion specifies that a model should not ''impede the provision of advanced services.'' In the *Universal Service Order,* the Commission disallowed a model's use of loading coils because their use may impede high-speed data transmission. During the model development process, the Bureau recommended that model proponents ''demonstrate how their models permit standard customer premises equipment (CPE) available to consumers today, such as 28.8 Kbps or 56 Kbps modems, to perform at speeds at least as fast as

the same CPE can perform on the typical existing network of a non-rural carrier.'' The BCPM proponents propose that testing a model network's capability to support data transmission over a 28.8 Kbps modem is a ''conservative approach'' to identifying whether a model may impede advanced services because network access at 28.8 Kbps is ''widely available today in urban areas'' and ''modem speeds of 33.6 Kbps and even 56 Kbps are becoming more and more common.'' We agree that a reasonable standard for ensuring that a model's network does not impede the provision of advanced services would ensure the reasonable performance of 28.8 Kbps modems. We find that proponents of the BCPM, HAI, and HCPM have demonstrated that their models allow 28.8 modems to work at reasonable rates, which will permit all customers to have access to high-speed data transmission.

4. Maximum Copper Loop Length

62. We now turn to the issue of the maximum loop length that the federal mechanism should permit. We note that, in making this determination, we must examine whether the models use the least-cost, most efficient, and reasonable technology while not impeding the provision of advanced services. HAI and BCPM proponents disagree on the maximum loop length over which a copper loop will carry a signal of appropriate quality, without the use of expensive electronics. The HCPM sponsors state that an 18,000 foot copper loop is capable of meeting current Bellcore standards, but they otherwise take no position on the appropriate length of copper loops. The maximum copper loop length will affect the model's cost estimates because a longer loop length will permit more customers to be served from a single DLC. As noted above, reducing the number of DLCs tends to reduce the overall cost. In the models, the ''fiber-copper cross-over point'' determines when carriers will use fiber cable instead of copper cable. BCPM asserts that Bell Labs standards call for loops not to exceed 12,000 feet. The proponents of BCPM further assert that copper loops longer than 13,600 feet will require the use of an expensive extended-range line card in the DLC to provide advanced services, the additional cost of which will outweigh the cost savings from using longer loops. Taking into consideration loading and resistance, the BCPM default provides that loop lengths that exceed 12,000 feet will be fiber cables. HAI contends that copper lengths may extend to 18,000 feet using only a slightly more expensive line card in the DLC.

63. The Commission sought comment on this issue in the *Further Notice* and a *Public Notice Requesting Further Comment.* A few commenters contend that use of the HAI standard would impede access to advanced services and violate Carrier Serving Area (CSA) design standards. The HAI proponents disagree, and contend that there is no support for the claim that a 18,000 foot copper loop is too long to support advanced services such as ISDN and Asymmetric Digital Subscriber Line (ADSL). The HAI proponents note that there are two ADSL standards, ADSL1 and ADSL2. The HAI proponents contend that no commenter alleges that the facilities modeled by HAI are unable to support ADSL1. Although the HAI proponents admit that their plant design cannot support ADSL2 using a loop length of 18,000 feet, they argue that the higher speed of ADSL2 is not a component of basic service supported by universal service.

64. We conclude that the federal mechanism should assume a maximum copper loop length of 18,000 feet. The record supports the finding that a platform that uses 18,000 foot loop-lengths will support at appropriate quality levels the services eligible for universal service support. Although BCPM has presented evidence that the provision of some, high-bandwidth advanced services may be impaired over 18,000-foot loops, we conclude that the BCPM sponsors have not presented credible evidence that the 18,000-foot limit will not provide service at an appropriate level, absent the use of expensive DLC line cards. We also disagree with BCPM's interpretation of the Bell Labs standards manual. The publication states, in pertinent part, that ''[d]emands for sophisticated services are requiring the outside plant network to support services ranging from low-bit rate transmission to high-bit rates. To meet this demand, a digital subscriber carrier is being placed into the network starting at 12,000 feet from the serving [wire center].'' The document is referring to the design of digital loop carrier systems and related outside plant that will ''accommodate a wide range of transmission applications including voice, data, video, sensor control, and many others.'' This design standard seems to exceed the service quality standards for universal service. We find that the public interest would not be served by burdening the federal universal service support mechanism with the additional cost necessary to support a network that is capable of delivering very advanced services, to which only a small portion of customers currently subscribe. Accordingly, we conclude that the federal mechanism should assume a maximum copper loop length of 18,000 feet.

IV. Switching and Interoffice Facilities

A. Discussion

65. We conclude that the federal universal service mechanism should incorporate, with certain modifications, the HAI 5.0 switching and interoffice facilities module. We find that HAI's module satisfies the relevant criteria set forth in the *Universal Service Order* and would be simpler to implement than BCPM's module. In our evaluation of the switching modules in this proceeding, we note that, for universal service purposes, where cost differences caused by differing loop lengths are the most significant cost factor, switching costs are less significant than they would be in, for example, a cost model to determine unbundled network element switching and transport costs.

66. We find that both models meet the *Universal Service Order's* requirement that a model assume the least-cost, most-efficient and reasonable technology to provide the supported services. Both models assume the use of modern, high-capacity digital switches, and interconnect switching facilities with state-of-the-art SONET rings. The *Further Notice* recommended that the federal mechanism should be capable of separately identifying host, remote, and stand-alone switches and of distributing the savings associated with lower-cost remote switches among all lines in a given host-remote relationship. In the *Further Notice,* we requested ''engineering and cost data to demonstrate the most cost-effective deployment of switches in general and host-remote switching arrangements in particular,'' and sought comment on ''how to design an algorithm to predict this deployment pattern.'' No party has developed an algorithm that will determine whether a wire center should house a stand-alone, host, or remote switch. As noted above, however, both models can incorporate either a single blended cost curve that assumes a mix of host, remote, and stand-along switches, or use the Bellcore Local Exchange Routing Guide (LERG) to assume the existing deployment of switches and host-remote relationships. In the inputs stage of this proceeding we will weigh the benefits and costs of using the LERG database to determine switch type and will consider alternative approaches by which the selected model can incorporate the efficiencies gained through the

deployment of host-remote configurations.

67. Both models also permit a significant amount of flexibility to ensure the allocation of a reasonable portion of the joint and common costs of the switching and interoffice functions to the cost of providing the supported services. As discussed below, however, BCPM's allocation methodology would introduce an additional degree of complexity to the inputs stage of this proceeding that we conclude is not administratively justified in light of the potential marginal gains in accuracy. We find that HAI's switching and interoffice modules satisfy the *Universal Service Order's* requirements to associate and allocate the costs of the network elements and functionalities necessary to provide the supported services, and do so in a less complex manner than BCPM's module, while still providing a degree of detail that is sufficient for the accurate computation of costs for federal universal service purposes.

68. We also find that HAI's switching module more fully satisfies the requirement that data, computations, and assumptions be available for review and comment. HAI's modules use a spreadsheet program that reveals all computations and formulas, allows the user to vary input costs, and provides a simple, user-adjustable allocation factor. BCPM also uses a spreadsheet program that reveals its computations and formulas, but its default costs and allocation factors are based on results from the proprietary Switching Cost Information System (SCIS) and Switching Cost Model (SCM) models, and the defaults used to generate the results that BCPM uses in its modules have not been placed on the record in this proceeding. To minimize concerns regarding BCPM's use of proprietary data, the Commission could, in the inputs stage of the proceeding, substitute other inputs in place of the SCIS and SCM results for the cost amounts and allocation factors. Because the SCIS and SCM generate such detailed results, however, the process of trying to determine input values to replace the SCIS and SCM results would inject a significant degree of complexity into the inputs phase of this proceeding. We conclude that this additional complexity in the inputs phase is not justified by potential gains in accuracy. As noted above, we find that HAI's modules compute and allocate switching and interoffice costs with a degree of accuracy that is sufficient for the computation of federal universal service costs and in a manner that more readily provides for public review.

69. We find that both models generally satisfy the requirement that each network function and element necessary to provide switching and interoffice transport is associated with a particular cost, though HAI satisfies the criterion more thoroughly than BCPM. AT&T contends that the BCPM 3.0 signaling network calculations indicate no explicit modeling of signaling costs. In BCPM, signaling costs used to develop per-line investments are provided through a user input table that its proponents assert reflects the cost of building a modern SS7 network. The signaling cost for a wire center is based on a weighted average of residence and business lines associated with that wire center. Users have the option of using the provided default values or entering their own values. In contrast to HAI, which explicitly models the cost of signaling, BCPM 3.0 simply adds on a signaling cost to the cost of switching based upon an input table of costs. Although this technically satisfies the criterion that any network function or element necessary to produce supported services must have an associated cost, we find that it is not likely to produce results that are as accurate as an estimate obtained through the explicit cost estimation used in HAI. The HAI 5.0 Switching and Interoffice Module computes signaling link investment to end office or tandem links between segments connecting different networks. HAI always equips at least two signaling links per switch and computes the required SS7 message traffic according to call type and traffic assumptions. We therefore conclude that HAI employs a more reliable method of assigning an associated cost to the network functions or elements, such as switching and signaling, that are necessary to produce supported services.

70. Thus, although we conclude that either model's switching and interoffice modules could be used to adequately model universal service costs for these functionalities, we conclude that the federal mechanism should incorporate the HAI modules. Moreover, parties recently have identified certain aspects of HAI's interoffice module with respect to which the progress of state proceedings has shown a need for minor changes in the model's coding. These changes were identified too late in the proceeding to be included in this Order. Because general agreement exists among the parties as to the need to make them, however, we delegate to the Common Carrier Bureau the authority to make these changes.

V. Expenses and General Support Facilities

71. We now consider the algorithms of HAI and BCPM for calculating expenses and general support facilities (GSF) costs in light of the criteria identified in the *Universal Service Order.* The most relevant of the criteria to expense and GSF issues is the ninth, which requires that the models make a reasonable allocation of joint and common costs. With this criterion, the Commission intended to ''ensure that the forward-looking economic cost [calculated by the federal mechanism] does not include an unreasonable share of the joint and common costs for non-supported services.'' Therefore, the platform of the federal mechanism must permit the reasonable allocation of joint and common costs for such non-network related costs as GSF, corporate overhead, and customer operations. In addition, the criterion requires that ''[t]he cost study or model must include the capability to examine and modify the critical assumptions and engineering principles.'' Therefore, it is important that the platform's method of calculating expenses and GSF costs must be sufficiently flexible. It is also important that we select model components that are compatible with one another to compute cost estimates in a reasonable time. In light of these considerations, we conclude that the platform for the federal mechanism should consist of HAI's algorithm for calculating expenses and GSF costs, as modified to provide some additional flexibility in calculating expenses offered by BCPM.

Discussion

72. Although we sought comment on alternative measures for estimating forward-looking GSF investment and other expenses, most commenters only address which expenses should be calculated on a per-line basis and which expenses should be calculated as a percentage of investment. We agree that the majority of expenses can be estimated accurately on the basis of either lines or investment. Other commenters argue, however, that GSF investment and other expenses should be based on ARMIS data for individual companies to ensure accuracy. GTE argues that, without empirical evidence, neither calculating expenses on a per-line nor a per-investment basis is entirely satisfactory. GTE proposes a time-series forecasting model, which it attaches to its comments. While we find that most expenses can be estimated accurately based on either number of lines or investment, we agree that

neither investment ratios nor per-line calculations may be entirely satisfactory for estimating the forward-looking costs of certain expenses. Further, we observe that many of the input questions regarding how best to calculate expenses will be resolved in the input selection stage of this proceeding, and find that the platform of the federal mechanism must be sufficiently flexible to allow for the correct resolution of these issues. In this way, we can best ensure that the model will correctly allocate joint and common costs and includes sufficient flexibility to allow the modification and examination of critical assumptions.

73. The Florida Public Service Commission agrees with our tentative conclusion that the cost of land, which comprises a large portion of GSF, should vary by state in order to reflect differing land values. In addition, the Florida Commission argues that, because of varying labor costs, state-specific expense-to-investment percentages should be used to estimate plant-specific operating expenses and state-specific per-line values should be used to estimate plant non-specific expenses. We note that there may be other variables, in addition to land values and labor costs, that may vary by state, and find that the model should allow GSF and expense calculations to vary by state. Both models allow the user to make different assumptions by state, thus both models provide the same degree of flexibility in this regard.

74. Because BCPM permits users to estimate all operating expenses (including GSF expenses) either as a per-line amount or as a percentage of investment and to adjust these amounts easily, it is somewhat more flexible than HAI in this regard. Because the federal mechanism must be sufficiently flexible to accommodate the decisions we will be making in the input selection phase of this proceeding, the HAI developers have made minor changes in their model so that expenses can be calculated on a per-line or percentage-of-investment basis. As noted above, many of the issues regarding the appropriate method of calculating forward-looking expenses will be resolved when we determine the input values that should be used in the federal mechanism.

75. We adopt our tentative conclusions in the *Further Notice* with respect to GSF investment and other expenses and conclude that the federal mechanism should: (1) be capable of calculating GSF investment and expenses by state; (2) provide the user with the capability to calculate each category of expense based either on line count or investment ratios; and (3) permit users to use different ratios or per-line amounts to calculate expenses for different size companies. We also conclude that the combination of model components that the Commission selects in this Order should be capable of generating cost estimates for the supported services within a reasonable time. The model will not be used to make final support calculations until next year, but it is important that the Commission and the Universal Service Joint Board can use the selected platform in the near term in connection with the issues that the Joint Board is considering in light of the *Referral Order*.

76. We find that the HAI and BCPM modules for computing expenses and GSF are roughly comparable, and conclude that the federal mechanism should incorporate the HAI module. Although, as noted above, the BCPM module may be somewhat more flexible, and therefore create the possibility for somewhat more fine-tuning at the inputs stage, we have thoroughly tested HAI's module and conclude that it generates accurate results. We also observe that expenses and GSF represent a small percentage of the total cost of providing the supported services. We therefore conclude that the practical benefits of using the HAI module outweigh those of using the BCPM module and that, in the interest of administrative efficiency, the federal mechanism should incorporate HAI's expense and GSF module.

VI. Conclusion

77. In this Order, we select a platform for the federal mechanism to estimate non-rural carriers' forward-looking cost to provide the supported services. To generate the most accurate estimates possible, we have selected the best components from the three models on the record. The model components selected are all generally available to the parties, and a software interface to merge the selected components is also available on the Commission's World Wide Web site. Thus, the federal platform is available for use by states, other interested policymakers, and the public. Pursuant to the plan established in the *Further Notice of Proposed Rulemaking*, we will continue to evaluate model input values with the intention of selecting inputs for the federal platform at a later date. Once input values have been selected, the federal platform will be used to generate cost estimates.

VII. Procedural Matters and Ordering Clauses

A. Final Regulatory Flexibility Act Certification

78. The Regulatory Flexibility Act (RFA) requires a Final Regulatory Flexibility Analysis (FRFA) in rulemaking proceedings, unless we certify that ''the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.'' It further requires that the FRFA describe the impact of the rule on small entities. The RFA generally defines ''small entity'' as having the same meaning as the term ''small business concern'' under the Small Business Act, 15 USC 632. The Small Business Administration (SBA) defines a ''small business concern'' as one that ''(1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) meets any additional criteria established by the SBA. Section 121.201 of the SBA regulations defines a small telecommunications entity in SIC code 4813 (Telephone Companies Except Radio Telephone) as any entity with 1,500 or fewer employees at the holding company level. In the *Further Notice of Proposed Rulemaking (Further Notice)* released July 18, 1997, the Commission considered regulatory flexibility issues relating to the selection of a mechanism to determine the forward-looking economic costs of non-rural LECs for providing supported services, but certified that there was no significant economic impact on a substantial number of small entities. The Commission found that non-rural LECs do not meet the criteria established by the SBA to be designated as a ''small business concern.'' Non-rural LECs are not small business concerns pursuant to the SBA guidelines because they are generally large corporations, affiliates of such corporations, or dominate in their field of operation. No comments were filed in response to the certification.

79. We therefore certify, pursuant to section 605(b) of the RFA, that this Report and Order will not have a significant economic impact on a substantial number of small entities. The Office of Public Affairs, Reference Operations Division, will send a copy of this Certification, along with this Report and Order, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, 5 USC 801(a)(1)(A), and to the Chief Counsel for Advocacy of the Small Business Administration, 5 USC 605(b). A copy of this final certification will also be published in the **Federal Register**.

B. Ordering Clauses

80. Accordingly, it is ordered, pursuant to sections 1, 4(i) and (j), and 254 of the Communications Act as amended, 47 USC 151, 154(i), 154(j), and 254, that the Fifth Report & Order in CC Docket Nos. 96–45 and 97–160, FCC 98–279, is adopted, effective 30 days after publication of a summary in the **Federal Register**.

81. It is further ordered that the Commission's Office of Public Affairs, Reference Operations Division, shall send a copy of this Report and Order, including the Final Regulatory Flexibility Certifications, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects

47 CFR Part 36

Reporting and recordkeeping requirements and Telephone.

47 CFR Part 54

Universal service.

47 CFR Part 69

Communications common carriers.

Federal Communications Commission.

Magalie Roman Salas,

Secretary.

[FR Doc. 98–30687 Filed 11–17–98; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 300

[I.D. 110498A]

Fraser River Sockeye and Pink Salmon Fisheries; Inseason Orders

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Inseason orders.

SUMMARY: NMFS publishes the Fraser River salmon inseason orders regulating fisheries in U.S. waters. The orders were issued by the Fraser River Panel (Panel) of the Pacific Salmon Commission (Commission) and subsequently approved and issued by NMFS during the 1998 sockeye and pink salmon fisheries within the Fraser River Panel Area (U.S.). These orders established fishing times, areas, and types of gear for U.S. treaty Indian and all-citizen fisheries during the period the Commission exercised jurisdiction over these fisheries. Due to the frequency with which inseason orders are issued, publication of individual orders is impracticable. The 1998 orders are therefore being published in this document to avoid fragmentation.

DATES: Each of the following inseason orders was effective when issued and upon announcement on telephone hotline numbers as specified at 50 CFR 300.97(b)(1) (See **SUPPLEMENTARY INFORMATION**).

ADDRESSES: Comments may be mailed to William Stelle, Jr., Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE., BIN C15700-Bldg. 1, Seattle, WA 98115-0070.

FOR FURTHER INFORMATION CONTACT: William L. Robinson, 206-526-6140.

SUPPLEMENTARY INFORMATION: The Treaty between the Government of the United States of America and the Government of Canada Concerning Pacific Salmon was signed at Ottawa on January 28, 1985, and subsequently was given effect in the United States by the Pacific Salmon Treaty Act (Act) at 16 U.S.C. 3631–3644.

Under authority of the Act, Federal regulations at 50 CFR part 300, subpart F, provide a framework for implementation of certain regulations of the Commission and inseason orders of the Commission's Panel for sockeye and pink salmon fisheries in the Fraser River Panel Area (U.S.). Each year these regulations apply to fisheries for sockeye and pink salmon in the Fraser River Panel Area (U.S.) during the period when the Commission exercises jurisdiction over these fisheries.

Under past agreements, the regulations close the Fraser River Panel Area (U.S.) to sockeye and pink salmon fishing unless opened by Panel regulations or by NMFS' inseason orders that give effect to Panel orders. The Commission's agreement for 1998 Fraser fisheries provided for set open and closed periods for U.S. Fraser fisheries and the Panel restricted these open periods as required to meet agreed to conservation and allocation objectives. During the fishing season, NMFS may issue orders that establish fishing times and areas consistent with the annual Commission regime and inseason orders of the Panel. Such orders must be consistent with domestic legal obligations. The Regional Administrator, Northwest Region, NMFS, issues the inseason orders. Official notice of these inseason actions of NMFS is provided by two telephone hotline numbers described at 50 CFR 300.97(b)(1). Inseason orders must be published in the **Federal Register** as soon as practicable after they are issued. Due to the frequency with which inseason orders are issued, publication of individual orders is impractical. The 1998 orders are, therefore, being published in this document to avoid fragmentation.

The initial Commission regulations for U.S. Fraser fisheries were as follows:

1. U.S. gill net and purse seine fisheries in Areas 6, 7, and 7A will be open Monday through Friday of each week during the period July 27 through August 21, and will remain closed at all other times during the Panel control period.

2. U.S. reef net fishery in Areas 7 and 7A will be open Saturdays and Sundays, July 25 through August 23, and will remain closed at all other times during the Panel control period.

3. The treaty Indian fishery in Areas 4B, 5, and 6C will be open noon Sundays through noon Fridays, July 26 through August 21, and will remain closed at all other times during the Panel control period.

The above regulations were modified by the following inseason orders which were adopted by the Panel and issued for U.S. fisheries by NMFS during the 1998 fishing season. The times listed are local times, and the areas designated are Puget Sound Management and Catch Reporting Areas as defined in the Washington State Administrative Code at Chapter 220–22.

Order No. 1998–1: Issued 3:00 p.m., July 24, 1998.

Treaty Indian Fishery

Areas 4B, 5 and 6C: Open for drift gillnets from 12:00 noon, July 26 to 12:00 noon, July 31.

All-citizen Fishery

Areas 7, 7A: During the period from 12:01 a.m., July 25 through 11:59 p.m., July 26, the reef net fishery will be open only from 5:00 a.m. to 9:00 p.m. on July 25 and from 5:00 a.m. to 9:00 p.m. on July 26.

Order No. 1998–2: Issued 5:00 p.m., July 24, 1998.

Treaty Indian Fishery

Areas 6, 7, and 7A: Net fishing closed from 12:01 a.m., July 27 to 4:00 a.m., July 28. Open from 4:00 a.m. July 28 to 7:00 a.m., July 29. Closed from 7:00 a.m., July 29 to 11:59 p.m., July 31.

All-citizen Fishery

Area 6: Closed to net fishing from 12:01 a.m., July 27 to 11:59 p.m., July 31.

Area 7 and 7A drift gillnet fishery: Closed from 12:01 a.m., July 27 to 7:10 a.m., July 29. Open from 7:10 a.m. to 11:59 p.m., July 29. Closed from 12:01 a.m., July 30, to 11:59 p.m., July 31.