COST PROXY MODELS IN RURAL TELEPHONE COMPANIES

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Introduction

The Federal-State Joint Board on Universal Service, CC Docket 96-45 ("Joint Board") published its *Recommended Decision* on November 8, 1996. Among other topics considered in that document, the Joint Board discussed the use of cost proxy models to determine the cost of network construction and by extension the cost of unbundled network elements. The Joint Board specified that the "technology assumed in [a cost proxy] model should be the least-cost, most efficient and reasonable technology for providing the supported services that is currently available for purchase."[1] Furthermore, the Joint Board specified that: "All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible."

Subsequent reports by the FCC and filings by interested parties have documented widespread and deep-rooted philosophical concerns within the telecommunications industry regarding cost proxy models *per se*. The cost proxy models created to date may be appropriate for the larger, urban area-based, incumbent local exchange carriers (ILECs) such as the former Bell operating companies and GTE; no opinion on that issue is offered here. However, it is clear that the cost proxy model procedures and unit prices proposed by the FCC are wholly unsuitable for use in rural areas. This report summarizes several areas in which this fact is evident, with particular emphasis on unit price input choices.

Geographic Considerations

Rural telephone companies face numerous geographic problems not experienced, for the most part, by large, urban-based ILECs. Among the distinctions that have a significant impact on the cost of network construction are the following factors.

Terrain

Many rural companies are located in areas with significant physical relief. Steep slopes pose particular obstacles to construction. For example, aerial plant placed in service in areas with steep slope often requires supplementary guying and support structures. As a second example, buried plant placed in service in areas with steep slope often must be placed at greater depth or with greater attention to cover and compaction to minimize the risk of cable exposure through erosion.

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[1] Federal-State Joint Board on Universal Service, CC Docket 96-45, *Recommended Decision*, November 8, 1996, ("Joint Board Decision"), paragraph 277.

These and numerous other issues related to terrain must be addressed by rural telephone companies during network construction. In each instance, the unit cost of construction is higher than would be the case in level terrain. The same issues also affect network maintenance costs and network upgrade costs. Rural telephone companies should be permitted to adopt higher unit prices to accommodate the factor of terrain - both slope and degree of terrain irregularity (roughness).

Although the cost proxy model includes a variable for slope, the model is unsatisfactory because it provides only partial consideration of terrain through its use of an "average slope" factor. Average slope may be a meaningful variable in urban areas where minimal variation is the general rule. Moreover, in urban areas, large volume contracts permit construction contractors to average costs and minimize the perceived effect of price differences due to terrain. However, the tremendous variations in slope that companies often face in rural areas, and the generally much smaller contracts for construction, render this simple measure inadequate. Rural telephone companies should be permitted to adopt higher slope adjustment factors.

Soil/Rock Conditions

Many rural companies are located in areas with significant adverse lithologic conditions. Construction in areas with rocky soil conditions is significantly more expensive than construction in new suburban sub-divisions. Indeed, many rural telephone companies must dedicate a significant proportion of their construction budget to rock sawing, rock drilling and similar placement activities. The comparatively high cost of such methods and the small size of the rural telephone companies mean that the relative cost impact of placing cable in rocky conditions is higher than it would be for urban companies. Rural telephone companies should be permitted to adopt higher rock and rocky soil adjustment factors.

Similarly, many rural companies are located in areas with significant adverse pedologic conditions. Coastal areas such as those in the Carolinas contain significant amounts of sand, which abrades plow shows and related equipment much faster than does suburban topsoil. Rural telephone companies should be permitted to adopt higher sandy soil adjustment factors.

Forested Areas/ Parks/Protected Areas

Many rural companies are located in areas with significant amounts of land reserved for state and national forests, state and national parks, nature preserves, military bases and other public uses. Cumulatively, the presence of these large reserve areas often forces inefficient construction methodologies to be adopted. For example, the shortest route to a remote serving unit cannot necessarily be used if it crosses a military base or contravenes other regulations. Similarly, the rights of Native American property holders (of reservations and other holdings) must be observed and appropriate permit fees must be paid for crossing such property even if permission is obtained. These factors contribute to increases in the cost of construction. Rural telephone companies should be permitted to define and adopt a factor to control for increased construction costs related to the presence of public lands.

Demographic Considerations
By definition, many rural companies are located in areas with relatively small populations and relatively low population densities. Both demographic factors force rural telephone companies to incur significantly higher construction costs.

Population Size
The five largest ILECs serve approximately 80% of the population of the United States. Cumulatively, the top ten ILECs serve almost 95% of the population. This factor of the size of the subscriber base is significant for several aspects of cost proxy model use.

Perhaps most significant, equipment manufacturers design, develop and, at least in the first instance, market equipment primarily for their larger customers. Manufacturers offer substantial discounts for large volume equipment purchases. Indeed, manufacturers have been known to provide equipment to large customers below cost at certain times (for example, early in the product cycle to encourage adoption and late in the year to supplement annual unit sales records).

No such volume discounts for central office and other equipment are available to rural telephone companies. The central office equipment (switch) pricing information contained in the cost proxy model is extremely poor, as argued in several FCC filings and as acknowledged by several model designers, and inappropriate for rural areas. Rural telephone companies should be permitted to define and adopt appropriate unit prices for switches and related equipment

Population Density
Although rural telephone companies may serve only approximately 5% of the US population, they do so over approximately 70% of the land area of the nation. The corresponding low population density for the typical rural telephone company forces such a company to incur disproportionately higher costs to provide service.

Customer Drops
The costs of terminals and drops vary greatly between zones of different population density. Within more densely populated areas, where subscribers are concentrated closer together, a design engineer can spread installation costs over a larger number of subscribers, particularly when pre-cabling subdivisions. Rural telephone companies should be permitted to adopt appropriate unit prices for drops.

This factor also affects the cross-connect or comparable flexibility-point technologies available to rural carriers. With greater drop spacing, the size of access cabinets is proportionately smaller. Rural telephone companies should be permitted to adopt appropriate unit prices for network interface devices.

Distances to subscribers - 1
Rural telephone companies must provide service from a single central office over a substantially larger area than would a large, urban ILEC. Even if one considers the use of remote serving unit technology, the physical network construction cost incurred by the rural telephone companies are substantially higher on a per-customer basis. To maintain network quality for the provision of contemporary services to schools, hospitals, and libraries, and of course, typical subscribers, as

well as enhanced services such as 911, rural telephone companies must engineer their networks with very different assumptions from those guiding the cost proxy model developers. Rural telephone companies should be permitted to define and adopt appropriate loop length calculation methodologies appropriate to the greater physical areas served. In passing, we note that these relatively long loops also will cause the rural telephone companies to incur greater maintenance and operating costs, further justification for modification of the unit costs.

Distances to subscribers - 2

In general, the length of drops to subscribers is greater in rural areas than in urban areas. This is a function of the greater average distance of the customers from the main roads, which itself is a function of the comparatively larger average land holdings typical of rural areas. This spatial characteristic affects the cost proxy model in another significant way. The FCC has determined that actual customer locations should be used with the cost proxy model, accepting the suggestion to use actual geocoded data if available and road network information where actual data are not available. However, According to the FCC's *Fifth Report & Order*, "the majority of commenters indicate that their geocode success rates decrease in rural areas."[2] Complicating the problem is the fact that the larger land holdings render the alternative (that is, use of the road network as a surrogate) non-viable without significant modification. Rural telephone companies should be permitted to define and adopt appropriate mechanisms for calculating rural subscriber locations.

Commercial Considerations

Transportation Costs

The relatively remote nature of rural telephone companies also contributes to higher network construction costs. Rural telephone companies incur higher transportation costs for equipment and material than do urban companies located closer to production facilities. Even in cases where urban carriers are located at some distance, the larger volume of purchases ensures discounts for transportation that are not available to smaller rural telephone companies. Rural telephone companies should be permitted to define and adopt a factor to incorporate equipment and material transportation costs into the unit price scheme. Alternatively, this problem offers further evidence for the need for flexibility in defining unit prices.

Other Service Costs

As with transportation costs, large urban ILECs can demand and expect to receive substantial discounts for construction service prices based on volume. No such volume discounts for construction services are available to rural telephone companies. Similarly, rural telephone companies can expect to pay proportionately higher costs for splicing services (and equipment such as fusion splicers), inspection services, locating services, maintenance and repair services, equipment installation and test services and other similar professional/technical services. Rural telephone companies should be permitted to define and adopt a factor to incorporate professional and technical costs into the unit price scheme. Alternatively, as with transportation, this problem offers further evidence for the need for flexibility in defining unit prices.

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[2] Federal-State Joint Board on Universal Service, CC Docket 96-45 and CC Docket 97-160, *Fifth Report & Order*, October 28, 1998, paragraph 34, footnote 71.

Structure Sharing

All versions of the cost proxy models (whether submitted and/or adopted) endorse sharing network construction costs among several companies where feasible. In brief, the concept assumes that several companies could use some or all support structures in a telephone network simultaneously. For example, in theory several companies could bury cables in a common trench with shared conduits and innerducts.

There are several tangible practical issues associated with structure sharing in rural areas that cost proxy models ignore. Most significant for rural telephone companies is the assumption that shared trench and conduit construction is even an economically feasible option. The predominant placement techniques in rural areas are direct cable plowing and aerial cable placement. For obvious reasons, the opportunities for structure sharing when directly plowing cable are limited. However, numerous problems also limit the opportunity for structure sharing with aerial placement.

The number of companies that may attach facilities to a pole depends primarily on the height of the pole, the class of the pole, and the number of pre-existing attachments. The height of the pole is a factor because federal, state, and local laws and ordinances, as well as safety considerations, mandate certain minimum clearances over roadways and railroad tracks below the cable span. Similarly, the class of the pole, which corresponds to the diameter of the pole, determines the total load that the pole may bear and the support guying required. Other parameters, such as the weight of the cable, also influence the minimum height at which users may attach cables to poles. In combination, these constraints determine the maximum theoretical number of cables that users may attach.

Rural aerial plant generally must cover significant distances at minimum cost through areas not reached by high volume roadways. This dictates that aerial plant will be constructed with poles that are placed at greater intervals than in urban areas. To reduce costs further, shorter poles are used. In combination, this means that mid-span sag will bring the cable much lower to the ground that the cost proxy model designers anticipated. Because the poles are smaller, there are fewer opportunities for structure sharing due to the reduced load-bearing capability of the poles. Consequently, rural telephone companies must be permitted to make significant changes to the assumed percentage of structure sharing in any cost proxy model.

Conclusion

The cost proxy models currently proposed by the FCC were built using input values (unit prices, engineering practices, structure sharing assumptions and similar variables) that were defined by the experience of large, predominantly urban-area ILECs. Such values are completely unsuitable for small, rural telephone companies for the reasons outlined here.

The large urban ILECs recognize the financial and commercial disincentives to providing services in rural areas that have been outlined here. That is why the large urban ILECs frequently have traded properties in rural areas, either to eliminate the problem by getting rid of the franchise area or to aggregate territories to achieve volume discounts in purchasing, transport and construction.

The question of the applicability of cost proxy models in the context of universal service remains open to public debate. To ameliorate the specific issues noted here and to accommodate the concerns of universal service, rural carriers must be allowed significant latitude in redefining, and in some cases supplementing, input values.