

**Section 1: CBT's Cost Studies**

**B. CBT's Model Assumptions and Methodology**

**1. CBT's Failure to Take a True Long-Run Approach**

**Q. Please discuss the first of the flaws in CBT's cost modeling effort--CBT's failure to take a true long run approach to costing. To begin, what is a true long run approach to costing?**

A. As standard economic terminology, the *long run* is a theoretical concept that does not directly correspond to normal experience. When considering long run production decisions, the firm can analyze virtually any size of plant and mix of inputs (e.g., copper vs. fiber) -- an option unavailable in the short run. While it is common practice to describe the long run in terms of time, in the strictest sense it does not correspond directly to any particular amount of time. Rather, the long run corresponds to the degree of flexibility the firm enjoys in sizing its capital investment and production process to best fit its output.

An entrant to a market supposedly starts with a long run planning horizon, in which all costs are variable, whereas an incumbent will normally find its planning horizon shortened by substantial fixed and sunk costs. With long run planning, a potential entrant to a particular market is free to select the size and type of investment that best matches its anticipated volume of output. With this greater flexibility, the new entrant (working in a long run planning horizon) may be able to produce output at a lower total cost than is possible for existing firms operating in a short run planning horizon. The existing firms have fewer options and thus are often burdened with unavoidable inefficiencies and added costs.

In the classic explanation of how the long run and short run concepts relate to each other, the long run average cost curve is typically described as the envelope of the entire array of all possible short run cost curves. Mathematically, this simply means that the long run reflects

a “best case” or lower bound on the potential range of average cost levels in the classic example. This follows directly from the added flexibility which is uniquely available to a firm operating in the theoretical long run planning horizon. The firm can pick and choose the exact mix of technology that minimizes total cost. Similarly, it can precisely match the scale of its operations (size of its network) to the volume of sales. This extra flexibility allows a firm to achieve a lower level of average cost in the long run than it would typically incur in the short run.

**Q. Is CBT’s costing approach a true long run approach?**

A. No. The Company’s approach is not a true *long run* approach--at least as this term is used by economists--because the Company takes its entire existing network design as a given, without adequately allowing for the type of variation and optimization which occurs in a true long run planning horizon. As explained during Mr. Mette’s deposition, CBT’s cost modeling approach relies very heavily on specific details of its existing network design. Its modus operandi was basically this:

- (1) Mr. Mette asks the engineers if there’s anything in the present practice (e.g., cabling sizes) they’d want to change.
- (2) The engineers say no, or suggest some very minor changes.
- (3) Data from the existing network is therefore adopted for use in the cost studies.

The following excerpt from Mr. Mette’s deposition is typical:

Q. Can you tell me how that weighting was determined between, you know, the 600 and the 25 pair cables?

A. Again, I will go back to, as a starting point, we looked at the cables that are in place in our company, and we got an inventory of all cables, and this is where we sat down again, worked with the engineers, and they looked at the cables that are in place, and in -- in some instances we have cables in place that just reflect maybe a pair at a time, we bought a particular cable, or a unique situation. We don't buy that stuff, we wouldn't expect to buy that stuff; so we took those out of consideration, and then that's based on what is in place and their review of what's in place and expectations of what they would expect to put in place. We developed these percentages from the percentages of cables that are currently in place. [Tr. 11/21/97, p. 90, ll. 5-19.]

Rather than looking at the optimal mix of cable sizes that would be installed on a brand new network utilizing the least costly technology, including the least costly mix of cable sizes, CBT simply looked at its historical cable mix and eliminated a handful of “outliers” or unusual cable sizes. While the rationale behind this approach is not completely clear, it apparently indicates CBT’s failure to recognize the distinction between a true long run planning horizon and the manner in which its engineers actually plan additions and changes to its network. CBT’s costing approach is essentially a cross between an embedded costing approach and a short-run costing approach. It is clearly not a true long run cost study, as that concept is defined in the economics literature. The questions CBT’s modelers asked the engineers were not sufficient to elicit or identify the many differences between the type of data descriptive of its existing network and the type of data needed for a true long run costing approach.

This problem is demonstrated by the case of the mix of cable sizes included in the study. Along any given route, there is a single “best” cable size, or combination of sizes which will minimize the cost of serving the specified demand (e.g., providing the required volume of loops). In the long run, the optimal type of cable (copper or fiber) and size (number of pairs) can be selected. However, in actual practice, firms operate with a different set of considerations, including the presence of existing facilities with sunk costs. Hence, the cable technology and mix that is observed within an existing network will generally not be the same as the one that would be selected in a true long run planning horizon. Where an existing network has slowly evolved over many years, one would expect to find a larger than optimal number of cables, of smaller than optimal size. The reason is that as demand grows, the existing cables often remain in place, and the firm simply adds additional cables to meet the growth. Thus, a feeder route might have four different cables of varying ages, with sizes ranging from 200 to 600 apiece, and totaling 1,200 pairs. If a firm were to build a network from scratch, its engineers would not install the same mix of cables; instead, they would install a single cable of 1,200 pairs, if this was the most cost effective option.

A similar problem exists with the fill factor the Company uses for its loop cost estimates. In a true long run planning horizon, the firm will optimize its capacity to match its output. Using the “scorched earth” approach, the long run analysis looks at the cost of constructing a network built from scratch (or, in the case of “scorched node” *de novo* from existing central office sites) with just enough spare capacity to provide operational flexibility (e.g., the ability to quickly respond to fluctuations in the day-to-day level of demand). In comparison, a somewhat larger amount of spare capacity would normally be present on an actual network for a firm that is operating in the short run. At some locations the firm may have less spare capacity than would be optimal, thereby increasing its total costs of administration and maintenance. At other locations a firm may have more capacity than would be optimal because it has anticipated future growth that has not yet materialized, or because it hasn’t accurately estimated the level of demand.

In the present proceeding, CBT uses its current fill factors for its forward-looking estimates. The Company argues that it routinely updates these historical fill factors, “as new information becomes available, technologies change, or engineering practices change.” [CBT response to PUCO Staff Data Request No. 66.0, 13.] Despite this vague claim, the numerical fill factors it has used are essentially just historical data taken from its existing network. The Company did not determine the cost-minimizing level of fill which is appropriate in a true long run planning horizon, where the firm has unlimited flexibility to optimize the network to achieve minimum cost.

**Q. In this proceeding, could the Company benefit from its failure to follow a true long-run costing approach?**

A. Yes. These deviations from true long run costing tend to inflate CBT’s cost estimates. Acceptance of these overstated cost estimates would allow the Company to charge higher rates for its unbundled network elements, would help bolster its argument in favor of increased pricing flexibility, and would lend credence to CBT’s claims regarding cross subsidies.

**Q. Is it appropriate to use embedded costing data (e.g., historical fill factors and cable mix) in this proceeding?**

A. No. For one thing, both the Commission's rules and the FCC's rules require use of "long run" cost estimates. Furthermore, the pricing standards set forth in the 1996 Telecom Act appear to reject an embedded cost approach, since the latter has always been associated with rate-of-return proceedings and such proceedings are expressly prohibited as a means of pricing unbundled network elements by section 252(d) of the Act. Similarly, in laying out the methods by which intercarrier transport and termination charges are to be set, the Act's rules of construction expressly deny commissions a rate-of-return based option. The section is NOT to be construed

(ii) to authorize the Commission or any State commission to engage in any rate regulation proceeding to establish with particularity the additional costs of transporting or terminating calls, or to require carriers to maintain records with respect to the additional costs of such calls. [§252(d)(2)(B).]

The Company's approach in this proceeding tends to translate into higher cost estimates than if it had followed a true long run approach. The effect is to raise its cost estimates to a level that better recovers the Company's embedded costs and perhaps comes closer to supporting its advocacy positions, but such estimates are fundamentally inconsistent with the long run costing concept which has been endorsed by this Commission and the FCC.

**Q It could be argued that the Commission's long run requirement can be met by an analysis that assumes that all costs vary but does not assume that all costs vary simultaneously. Do you agree?**

A. No. Of course, this argument has a certain intuitive appeal, if one assumes the "long run" involves a very long period of time. If it takes a long time to adjust to changing conditions, it may seem logical to assume that the firm can minimize only a portion of its costs in any given

time period, and thus costs will tend to fall above the minimum level, because the firm never quite gets to the point where it has optimized all of its operations in order to truly minimize costs. For example, one might argue that over a long period of time, it is logical to install a series of smaller cables, rather than a single large one.

Any such argument is misplaced in the context of this proceeding. This Commission has concluded that unbundled element prices should be based upon long run economic costs in order to best implement the Telecom Act of 1996. This is a sound approach, which is fully consistent with the public interest. Hence, I recommend that the Commission use a true long run costing approach.

By definition, in the long run all inputs can be optimized. To understand the rationale behind this definition, it is necessary to recognize that the long run need not be long in terms of years. To the extent the long run has any time dimension, it can be thought of as whatever length of time it takes for all costs to be variable, so that the firm can reach a true optimum. If a firm could construct a network that achieves long run cost minimization in a year, then the long run could be thought of as lasting a year. However, the issue is not really what length of time it would take for a new network to be built, nor how long it would take a firm to totally rebuild or replace its existing system. In fact, the long run concept is not tied to any particular length of time. Rather, it is simply a way of looking at the world "as if" it were possible to achieve an optimal deployment of resources. While it is a hypothetical concept, the long run is not completely unrealistic, nor is it a concept that relates only to the distant future.

We must not confuse a theoretical construct--the *long run*--with the evolutionary process that real-world firms engage in as they expand, contract, and respond to changing market conditions and technologies. It is true that in the "real world" firms deploy networks over a period of years; and the incumbent LEC continues to grow and replace its facilities at a pace that minimizes its costs. But this is a description of a dynamic process that is more closely analogous to a sequence of short run planning horizons, rather than a true long run planning horizon.

In the real world, at any given time, many of the firm's costs will be fixed (and some will be sunk). The presence of these fixed or sunk costs influences the firm's optimization criteria, and causes the firm to make decisions which are different from what would be optimal in the long run. For example, in the short run, a firm that needs to expand its loop capacity in a particular area may temporarily respond by installing a subscriber line carrier system, which electronically derives 24 channels from just 2 pairs of copper wire. This modification creates a twelve-fold expansion of loop capacity at moderate cost. In the short run, this option would probably be cheaper than overbuilding the existing system with additional copper or fiber cable. However, when our focus shifts to the long run planning horizon, the firm can almost undoubtedly find a cheaper alternative. It might substitute a larger copper cable for the one which is currently in existence, thereby providing a large enough cross-section (sheath size) to handle all of the demand. Or, if a fiber system would be cheaper than a large copper cable, it might select that option. Like a new entrant that is starting from scratch, an existing firm is assumed to have a complete array of options in the long-run planning horizon. In the long run it can select the most cost-effective choice, and thus it is assumed to have complete flexibility to minimize its total costs (and thus its average costs). Such complete flexibility includes some options, like fine-tuning of cable sizes, which simply aren't practicable in a short run planning horizon.

In a typical long run cost study, the only thing that doesn't vary is the wire center and the location of the households and businesses. The latter simplification has become a standard practice in the industry--known as the scorched node approach--because it fits the theory well yet simplifies the modeling process. Also, it makes it easier to relate the cost results back to the real world than in the pure scorched earth approach. But aside from this simplification, everything else should be allowed to vary, in order to appropriately match the size of the network to the assumed level of demand.

Some are troubled by the theoretical nature of the long-run planning horizon, which makes it seem irrelevant to real world problems. However, it is actually a very important

concept in economics. Long-run cost curves provide us with an understanding of certain tendencies, or limits, within which normal firms operate, as well as a better understanding of the equilibrium conditions towards which markets gravitate. The long run can be particularly useful to regulators, since it provides a benchmark indication of the level of costs that would be incurred if a firm were to select an optimal mix of technologies, and carefully match the scale and scope of its operations to the actual level of market demand.

**Q. Since the Company's studies are not truly long run, would it be more accurate to describe them as providing short run estimates?**

A. No. Granted, the Company's cost studies include many assumptions and elements that are tied to its existing network, and to a degree they resemble short run cost estimates. However, there are important differences between its approach and a true short run cost analysis. The real world is a very different place from the one the Company's study assumes, because real world firms have sunk costs and heavily depreciated but still functional assets. The Company's study does not appropriately capture the effect of these existing assets on the firm's short run cost curves, or its real world optimization process.

When modeling a firm that operates using an existing network (as opposed to a hypothetical new network), it is necessary to carefully analyze the appropriate treatment of the fixed, or sunk, costs of this existing infrastructure. For instance, in a short run study, it wouldn't be logical to make wholesale substitutions of fiber for copper technology, especially on routes where ample capacity has already been installed. Although I have no direct knowledge of the age of copper loops in CBT's service territory, there are probably some distribution cables and drops that are decades old and have been heavily depreciated yet continue to provide useful service. While maintenance costs may exceed those of new fiber cable, such existing plant will continue to be useful and also continue to impose maintenance costs that are below those of installing and maintaining a new fiber system, including the required fiber electronics. The Company's studies assume use of digital line carrier (DLC) technology on all loops of 12,000

feet or more, without regard to the existing technology or the level of spare capacity in the current cables [Mette Deposition Tr. 11/21/97, pp. 52-4.] Therefore, these studies are clearly not consistent with short run cost minimization.

Similarly, while CBT has taken its existing cable mix as a key input to its study, CBT has assumed that it is necessary to incur the full cost of installing these existing cables. In a true short run study, many, if not all, of these cables would be treated as having fixed or sunk costs, with little or no impact on the final cost results.

CBT's cost study approach relies heavily upon data showing how its network has evolved over time. It does not reflect how that network would look if it were completely replaced with a new one that is optimally designed to serve current and near-future demand at minimal cost. To the extent the economists' standard tool box contains cost concepts that directly correspond to those incurred by existing real-world firm, it is fair to say that these firms operate in a continual succession of short run planning horizons. At any one point, the firm faces short run cost minimization decisions in which many of the existing facilities have sunk costs which are irrelevant. The short run cost curves most closely correspond to a firm's real world situation at any point in time, but short run cost calculations differ from those submitted by the Company in this proceeding, because they do not involve "pricing out" the cost of installing existing facilities (e.g., cables).

**Q. If the Company's approach is neither long run nor short run, what is it?**

A. The Company's approach appears to be an ad hoc mixture of long run and short run elements, in which historical data are subjectively and arbitrarily converted to forward looking estimates. As such, the approach has no standing in economic theory.

**Q. Is it appropriate for the Commission to insist upon true long run studies from the Company?**

A. Yes. The significance of a long run approach lies in its relationship to the dynamics of a competitive market. To the extent the Commission prices network elements based upon long run costs, without regard to CBT's actual historical or embedded costs, the Commission will be able to set prices with desirable and predictable impacts on competition. Most of the Company's embedded costs are "sunk" costs having little or no relevance in a competitive market. Thus, by de-emphasizing embedded costs and focusing instead on long-run economic costs, the Commission can ensure that its pricing decisions are consistent with its policy goals.

In particular, to encourage a rapid transition towards effective competition, the Commission will need to adopt regulatory policies that help break down barriers to entry and exit. The magnitude of the cost-related barriers can best be analyzed in terms of long run cost—the type of cost typically faced by a potential entrant.

For example, if the Commission were to accept CBT's inflated cost figures and set unbundled element prices above the long-run costs that would be incurred by a new entrant installing its own facilities, it will not be encouraging new entrants. Stated differently, if unbundled element prices are set at unduly high levels, very few unbundled elements will be acquired by new entrants, and the situation will be essentially the same as if unbundling had not been mandated. Such a result would conflict with the Commission's obligations to foster competition.

A long run approach to costing can also help the Commission avoid setting element prices so low that little or no incentive exists for the installation of new facilities by new entrants. In effect, unbundled element rates (or, for that matter, wholesale rates for resold services) that are well above long run average cost will create a barrier to entry by resale or mixed mode competitors, thereby limiting entry to those firms that have the wherewithal to install their own network facilities. By the same token, however, unbundled element rates that are well below long run average cost will have the effect of discouraging facilities-based entry, since a NEC

will not be able to reduce its costs by substituting its own facilities for the unbundled facilities of the incumbent LEC. Of course, it is also important that the incumbent LEC be allowed the opportunity to recover its investments and not be left with stranded costs that have been occasioned, not by actual obsolescence, but by declining costs in the industry. The Commission demonstrated its cognizance of this problem in its Local Service Guidelines, specifically, in V.B.4.(c)