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Consulting Economists

DIRECT TESTIMONY

OF

DR. WILLIAM E. TAYLOR

ON BEHALF OF

VERIZON NEW ENGLAND INC.

D/B/A/ VERIZON MASSACHUSETTS

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DIRECT TESTIMONY OF WILLIAM E. TAYLOR

I. INTRODUCTION AND CONCLUSIONS

Q. Please state your name, occupation, and business address.

A. My name is William E. Taylor. I am Senior Vice President of National Economic Research Associates, Inc. (NERA), head of its telecommunications economics practice, and head of its Cambridge office. My business address is One Main Street, Cambridge, Massachusetts 02142.

Q. Please summarize your qualifications.

A. I have been an economist for over twenty-five years. I received a B.A. degree in economics (Magna Cum Laude) from Harvard College in 1968, a master's degree in statistics from the University of California at Berkeley in 1970, and a Ph.D. in Economics from Berkeley in 1974, specializing in industrial organization and econometrics. I have taught and published research in the areas of microeconomics, theoretical and applied econometrics, and telecommunications policy at academic institutions (including the economics departments of Cornell University, the Catholic University of Louvain in Belgium, and the Massachusetts Institute of Technology) and at research organizations in the telecommunications industry (including Bell Laboratories and Bell Communications Research, Inc.). I have participated in telecommunications regulatory proceedings before state public service commissions, the Federal Communications Commission (FCC) and the Canadian Radio-television and Telecommunications Commission concerning incentive regulation, price cap regulation, productivity, access charges, and pricing for economic efficiency. A copy of my vita listing publications and testimonies is shown as WET-Exhibit 1.

Q. Have you testified before the Massachusetts Department of Telecommunications and Energy?

A. Yes, I have testified before the Massachusetts Department of Telecommunications and Energy ("DTE" or "Department") on a number of issues including: price regulation (D.P.U. 94-50), local competition (D.P.U. 94-185), intercarrier compensation for Internet-bound traffic (D.T.E. 97-116-B), and the 1996-1998 proceedings in Massachusetts that set prices for unbundled network

elements (D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94).

Q. What is the purpose of your testimony?

A. Verizon – Massachusetts ("Verizon-MA" or the "Company") has asked me to discuss the basic economic principles regarding the recurring and non-recurring costs for interconnection and unbundled network elements, and to address whether the Company's cost models comply with the relevant FCC rules.

Q. Please summarize your conclusions regarding the cost of interconnection and unbundled network elements.

A. The Verizon-MA cost studies are consistent with the FCC's rules as set forth in the *Interconnection Order*.[1] Specifically,

1. Verizon-MA's approach to determining the costs of network elements is consistent with the FCC's total element long run incremental cost (TELRIC) concept. (For ease of exposition, except as noted, I use the term "network elements" to refer to both network elements and interconnection services.) TELRIC, as defined by the FCC, is the total service long run incremental cost (TSLRIC) of a network element.

2. The TELRIC approach in the FCC *Interconnection Order* reflects the forward-looking technology that is expected to be deployed in the long-run.

The total forward-looking cost of interconnection and network elements include shared fixed and common costs as well as direct incremental costs. The FCC *Interconnection Order* recognizes

[1] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, Report and Order, 11 FCC Rcd 15499 (1996) ("*Interconnection Order*") *vacated in part and aff'd in part sub nom. Iowa Utilities Board*; *Order on Reconsideration*, 11 FCC Rcd 13042 (1996); *Third Order on Reconsideration and Further Notice of Proposed Rulemaking*, CC Docket Nos. 96-98, 95-185, FCC 97-295 (rel. Aug. 18, 1997); *Iowa Utilities Board* v. FCC, Nos. 96-3321, et al. (8th Cir. July 18, 1997).

Note, however, that the Eighth Circuit Court's July 18, 2000 decision, *Iowa Utilities Board* v. FCC, Nos. 96-3321, et al. (8th Cir. July 18, 2000), vacated the Federal Communications Commission's total element long-run incremental cost (TELRIC) rule 51.505(b)(1), which was developed in the *Interconnection Order*. The United States Supreme Court is considering this issue, and therefore the FCC's mandatory cost and pricing rules may change.

this principle.[2]

Also, consistent with the *Interconnection Order*, the Company's cost studies do not include historical (embedded) costs, opportunity costs, or universal service subsidies. Nevertheless, these are real costs to the company, and the company must have an opportunity to recover them from its services (see footnote 1, supra).

Q. How is your testimony organized?

A. First, I review general cost concepts. It will be important to understand each of these cost concepts in order to understand the FCC's UNE pricing rules. Second, I discuss the pricing principles for unbundled network elements, including a review of why common and shared fixed costs must be included for pricing purposes. Third, I review the methodology behind the Company's recurring cost models in light of the FCC's rules. Fourth, I review the methodology behind the Company's non-recurring cost models in light of the FCC's rules.

II. COST CONCEPTS

Q. What cost concepts are important to understand in light of the FCC's rules for setting unbundled network element and interconnection rates?

A. There are a number of important cost concepts to understand. I will review the following:

- variable and fixed costs;
- incremental costs;
- long-run and short-run costs;
- Long Run Incremental Cost (LRIC); and
- Total Service Long Run Incremental Cost (TSLRIC)

A. Variable and Fixed Costs

Q. What is the difference between variable and fixed costs?

[2] See, e.g., the discussion of the TELRIC methodology in paragraphs 672-703 of the *Interconnection Order*.

A. Generally speaking, a product or service is made up of two types of costs, (i) *variable* costs and (ii) *fixed* costs. A *variable* cost is a cost that varies with the volume of the activity that generates it. Thus, for example, the cost of cable to serve 8 million loops is greater than the cost of cable to serve 5 million loops. An important characteristic of a variable cost is that it is always possible to identify the "cause" of a variable cost. In the cable example here, the cause of the cost is an increase in the number (volume of) customers.

A *fixed* cost, on the other hand, is a cost that does not vary with the level of activity or volume of output. A fixed cost will not increase or decrease as the volume of output changes. The only way to avoid a fixed cost is to cease altogether the activity that generated it. Thus, if the subscriber base of an incumbent telephone company shrank from 8 million to 1 million, the company would still incur roughly the same fixed costs, but its variable costs would decline.

Q. Are there different types of fixed costs?

A. Yes. For a multiproduct firm like Verizon-MA, we can distinguish among three types of fixed costs: *service-specific*, *shared*, and *common* fixed costs.

1. *Service-specific fixed costs* are those fixed costs associated with the supply of a particular service. By definition, such costs are independent of service volume, but are incurred only when the specific service is offered. The cost of a right to use fee, for instance, is generally invariant to the level of service output, and can only be avoided if the service is no longer provided.

2. *Shared fixed costs* are those fixed costs associated with supplying a group (but not all) of the firm's services. In this context "fixed" means those costs vary with neither the level of activity, nor the volume of output associated with any individual service within the group, nor the decision to produce or cease producing any individual service or subset of services within the group.

3. *Common fixed costs* are those fixed costs not associated with any specific service or group of services provided by the firm. Instead, common fixed costs are shared by *all* services produced by the firm. The president's desk is the classic example of a fixed cost that is common to all services.

B. Incremental Costs

Q. What are incremental and marginal costs?

A. *Incremental costs* are the change in forward-looking costs required to produce an additional increment of output. For example, an analyst can calculate the incremental cost of a single unit, 100 units, or the incremental cost of all the units produced by the company. *Marginal cost* is used to describe incremental cost where the increment is a single unit. Marginal cost is the additional cost caused (or saved) by increasing (or decreasing) the production of a product or service by a single unit, holding constant the production levels of all other products and services offered by the firm. Thus, the marginal cost of an unbundled loop would simply be the cost of one additional loop.[3]

Q. Is there a term for incremental cost where *all* the units produced by the firm is the increment?

A. Yes. *Total service* incremental cost is the forward-looking costs avoided (or added) by discontinuing (or offering) an entire product or service, holding constant the production levels of all other products and services offered by the firm. Thus, if we thought of incremental cost in terms of total service incremental cost then the incremental cost of unbundled loops would be the cost of all the loops in the network.

The diagram below provides a visual description of the cost taxonomy specified above.

[3] As we will discuss later, the incremental concept used to measure the cost of loops is *total service long run incremental cost*.

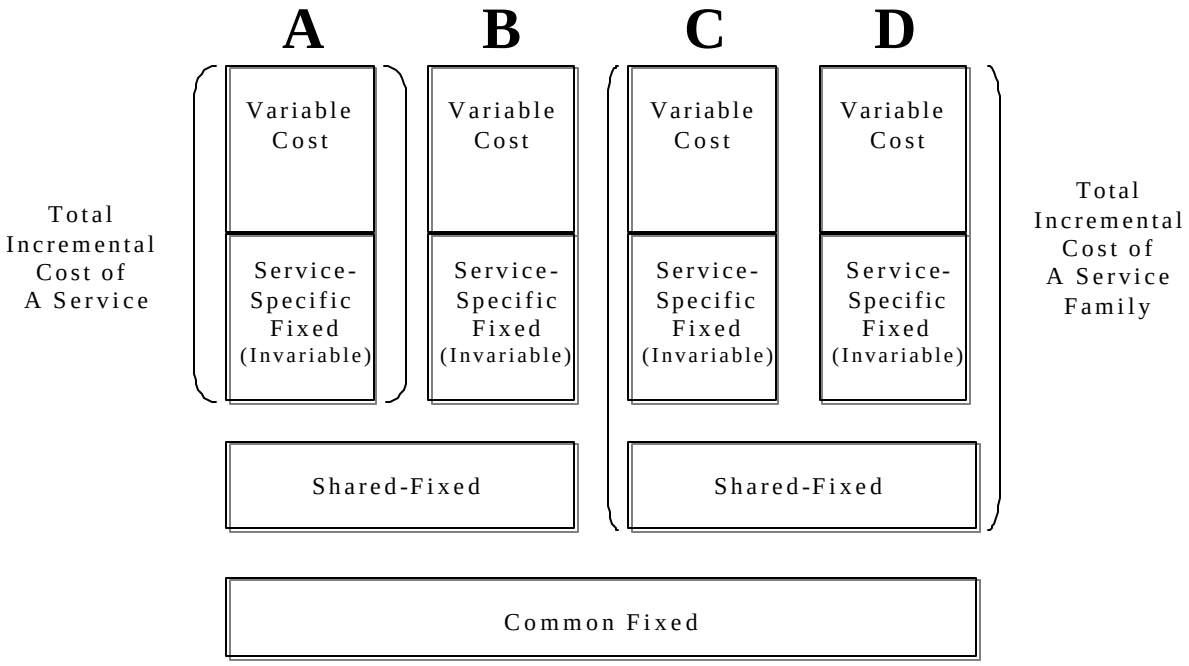

Figure I: Cost Concepts[4]

C. Long-Run and Short-Run Costs

Q. What is the difference between long-run and short-run?

A. *Long-run* and *short-run* are terms used to describe a costing period. For example, when a cost analyst calculates incremental costs in the long run, she permits the firm to adapt to the incremental change in demand by choosing and arranging its plant to produce the required level of output in the most efficient manner possible. On the other hand, if costs are calculated in the short-run, she treats the firm as constrained to use existing plant capacity.

Two terms that may require some clarification at this point are *long-run fixed* costs and *sunk costs*:

Long-run fixed costs are those costs that are not changed, even in the long run, by

[4] See, *Marginal Cost Techniques for Telephone Services: Symposium Proceedings*, Edited by William Pollard, National Regulatory Research Institute, January 1991, p. xviii.

changes in output so long as production does not completely cease.

Sunk costs are those costs that (in the short or intermediate run) cannot be eliminated, even by total cessation of production.

D. Long Run Incremental Cost

Q. What is Long Run Incremental Cost?

A. Long-Run Incremental Cost (LRIC), includes all the *variable* costs of a specific increment of service. From a public interest perspective—*i.e.*, an efficient economic outcome where society's scarce resources are allocated to their highest-valued purpose—the price of every increment of output demanded should equal or exceed its LRIC. Otherwise, if price were set below LRIC, a customer would consume units of service whose cost to supply exceeded the value of what the consumer gave up to pay for consuming the unit of service. Such consumption would be wasteful, and at a service price below LRIC, the consumer would be induced to consume too much of the service.

E. Total Service Long Run Incremental Cost

Q. What is Total Service Long Run Incremental Cost?

A. Total Service Long-Run Average Incremental Cost (TSLRIC) is a special case of incremental cost, where the increment of output in question is the total volume of a service. That is, TSLRIC for a new service measures the increase in costs causally associated with the supply of the service at the full volume of its likely demand. TSLRIC differs from ordinary incremental cost in two respects:

- The per-unit TSLRIC measures an average incremental cost over the entire range of output of the service. If incremental cost varies with output (possibly due to economies of scale), the average incremental cost over the entire range of output will differ from the marginal cost measured at the current level of output.

- TSLRIC includes service-specific fixed costs, *i.e.*, costs that do not vary with the level of output but would be saved if the firm discontinued production of the service.

Economists sometimes refer to TSLRIC and LRIC as incremental costs respectively expressed on an *average* or *per unit* of service basis.

III. PRICING PRINCIPLES FOR UNBUNDLED NETWORK ELEMENTS

Q. What is important about the cost concepts you described above?

A. The cost concepts I have discussed are important because they underlie the purpose of this proceeding—setting rates for unbundled network elements (UNEs). The *Interconnection Order* mandates that:

> ...prices for interconnection and unbundled elements...should be set at forward-looking long-run economic cost. ...[T]his will mean that prices are based on the TSLRIC of the network element, which we will call Total Element Long Run Incremental Cost (TELRIC), and will include a reasonable allocation of forward-looking joint and common costs. (at ¶ 672. See also ¶ 29.)

Thus, according to the *Interconnection Order*, prices for network elements should equal the sum of TELRIC and a reasonable allocation of shared fixed and common costs:

UNE PRICE = TELRIC + Allocation of Shared Fixed and Common Fixed Costs

Q. You did not mention TELRIC in your discussion of cost concepts. What is TELRIC?

A. TELRIC—"Total Element Long Run Incremental Cost"—is not a term defined by economists. Rather, it is a term created by the FCC to define a costing approach for setting UNE rates. As the FCC stated, "[w]hile we are adopting a [costing] methodology commonly referred to as TSLRIC as the basis for pricing interconnection and unbundled elements, we are coining the term 'total element long run incremental cost' (TELRIC) to describe our version of this methodology."[5]

Q. What are the characteristics of forward-looking costs?

A. As required by the FCC, forward-looking costs (i) disregard historical and sunk costs that cannot

be changed by actions in the future, and (ii) take into account as much data as are available about expected operating characteristics.

Paragraph 678 of the *Interconnection Order* states:

> Under the third approach [the one chosen by the FCC], prices for interconnection and access to unbundled elements would be developed from a forward-looking economic cost methodology based on the most efficient technology deployed in the incumbent LEC's current wire center locations...basing prices on efficient, new technology that is compatible with the existing infrastructure. This benchmark of forward-looking cost and existing network design most closely represents the incremental costs that incumbents actually expect to incur in making network elements available to new entrants. Moreover, this approach encourages facilities-based competition to the extent that new entrants, by designing more efficient network configurations, are able to provide the service at a lower cost than the incumbent LEC. We, therefore, conclude that the...pricing methodology...should be based on costs that assume that wire centers will be placed at the incumbent LEC's current wire center locations, but that the reconstructed local network will employ the most efficient technology for reasonably foreseeable capacity requirements.[6]

Thus, the *Interconnection Order* finds that:

- forward-looking economic costs are "based on the most efficient technology deployed in the incumbent LEC's current wire center locations"; and
- "This benchmark of forward-looking cost and existing network design most closely represents the incremental costs that incumbents actually expect to incur...."; and
- the network should accommodate "reasonably foreseeable capacity requirements." This means that the forecast should try to account for growth and the impact of competition if possible.

Q. Should prices be set equal to TELRIC?

A. No. Rates should generally exceed TELRIC because TELRIC measures only direct costs and the

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(...continued)

[5] *Interconnection Order* at ¶ 678.

[6] *Interconnection Order* at ¶ 685 (emphasis added).

firm must also recover shared and common costs.[7] Since TELRIC does not include common or shared fixed costs it must be marked up to determine the total forward-looking cost of an element, as required by the FCC's rules.

Q. Please explain why it is reasonable to include a suitable portion of common (overhead) and/or shared fixed costs in the total economic cost of a UNE.

A. To understand why this is the case, we must explain the concepts of economies of scale and economies of scope. Economies of *scale* refers to the decline in unit cost of producing a service as the quantity supplied of that service increases. For example, economies of scale may occur when a firm can manufacture more cars and reduce the average cost of a car on its production line. Economies of *scope* arise when the combined total cost of providing two or more services is less than the sum of the costs of providing those services separately. For example, an economy of scope occurs when one firm uses the same production facilities to manufacture cars *and* trucks thus reducing the average cost of both. Economies of scale can arise because of a more intensive use of fixed-cost productive resources at higher levels of supply. Economies of scope arise when multiple services share fixed cost productive resources or facilities. Both forms of economies result in lower incremental service costs.

In the presence of economies of scale and/or scope, incremental cost only defines the *price floor* for a service, i.e., the level below which the price cannot fall. The total price, however, would typically have to exceed the price floor when there are scale or scope economies because the same fixed costs—service-specific or shared/common—that give rise to the economies of scale and/or scope cannot be recovered fully by setting service prices *equal* to their respective incremental costs.

[7] Recall that shared and common fixed costs are not directly associated with any particular activity or output.

IV. ESTIMATING THE RECURRING COST OF UNBUNDLED NETWORK ELEMENTS

A. Basic Steps to Estimate Costs

Q. What are the basic steps required to estimate the LEC's forward-looking cost?

A. Estimating the recurring costs of network elements involves four basic steps:

1. Forecast the demand for the network elements.

2. Estimate how much it will cost to make the investments needed to meet the demand forecasted for the LEC's network.

3. Calculate the monthly expense for items such as lines or transport facilities and the expense per unit of usage for services purchased on a per-use basis. There are two basic types of expenses: (i) investment expenses for the return on investment and for depreciation (the return "on investment") to those who provided the funds to the company; and (ii) operating expenses, such as maintenance and repair costs, and costs of customer service.

4. Estimate the forward-looking common costs associated with each network element.

B. Applying the FCC Approach to Recurring Cost Estimation

Q. What are the basic TELRIC guidelines that the FCC set out for estimating the recurring cost of elements?

A. The FCC *Interconnection Order* states that TELRIC should:

- be forward-looking,[8]
- include directly attributable costs for the entire increment of the element,[9]
- use economic depreciation rates for plant,[10]

[8] *Interconnection Order* at ¶ 694-698.

[9] *Interconnection Order* at ¶ 690.

[10] *Interconnection Order* at ¶ 703.

- use forward-looking cost of capital,[11]
- use reasonable fill factors for cable,[12] and
- be based on existing wirecenter locations.[13]

Q. What must be done to estimate TELRICs for UNEs that are consistent with these principles?

A. A forward-looking TELRIC assessment should:

1. Estimate costs for the forward-looking technology to be deployed using the most efficient methods and practices developed by engineers for current, actual use in planned plant investment decisions and construction. Thus, the study should use costs for equipment and labor based on current company practices regarding actual expected investment, i.e., currently used practices adjusted to capture anticipated changes in company practices, and anticipated inflation or deflation. This approach would capture both:

    - currently anticipated technology types; and
    - currently anticipated plans and expected equipment prices for plant to meet growth and to replace existing plant with new plant.

2. Take into account expected network characteristics as determined, for example, from engineering surveys of facilities. The surveys will reflect actual experience with: (i) natural characteristics (topography, geography and geology, e.g., bodies of water, hills, and surface type), (ii) man-made characteristics (e.g., roads, buildings, major facilities like airports), and (iii) governmental requirements (such as zoning restrictions and regulatory obligations that govern Verizon-MA's provision of service). This does not mean that these factors must be explicitly modeled; by basing the cost estimate on the actual expected network characteristics we can capture the impact of these factors.

3. Base the cost calculation on actual demand forecasts for the company to be studied (i.e., on "reasonably foreseeable capacity requirements,"[14]). Thus, the per-unit economic cost

[11] *Interconnection Order* at ¶ 700.

[12] *Interconnection Order* at ¶ 682.

[13] *Interconnection Order* at ¶ 690.

[14] *Interconnection Order* at ¶ 685

> equals the...economic cost of the element...divided by a reasonable projection of the sum of the total number of units of the element that the incumbent LEC is likely to provide to requesting telecommunications carriers and the total number of units of the element that the incumbent LEC is likely to use in offering its own services...[15]

4. Employ anticipated future "fill factors" or utilization rates estimated based on actual experience with meeting market and regulatory requirements regarding the provision of service in an area.

5. Develop annual cost factors based on forward-looking, company-specific debt-equity ratios, debt costs and equity costs and using economic lives to calculate depreciation.

Q. You mentioned that a forward-looking assessment should use anticipated plans and expected equipment prices for plant to meet growth. Why is it important to account for growth?

A. It is important to account for growth to develop more realistic estimates of the forward-looking economic costs of service. Failing to account for growth will understate costs: facilities that serve exactly 10 households in perpetuity are much cheaper (per household) than a network that serves 10 households today in a neighborhood that grows at 3 percent per year. Switch sizes and cable sheath sizes are two examples of facilities that would be much cheaper (per household) if they could be costlessly sized to meet demand at every point in time. In reality, these facilities cannot be resized as growth occurs, and additional costs are incurred to serve growing demand at a constant level of quality over time.

C. Verizon-MA's recurring cost study is consistent with the FCC's methodology.

Q. Is the Verizon-MA recurring cost study consistent with the FCC methodology?

A. Yes. The Verizon-MA cost study has the characteristics mandated by the FCC *Interconnection Order*. The study: (a) includes directly attributable costs (follows the principles of cost recovery);

[15] *Interconnection Order*, Appendix B. Sec. 51.511.

(b) is forward-looking; (c) is long-run; (d) is based on existing wire center locations; (e) uses reasonable fill factors; (f) uses economic depreciation rates; (g) includes a forward-looking cost of capital; and (h) includes a reasonable allocation of shared and common costs.

Q. Are Verizon-MA's cable cost input assumptions consistent with the FCC methodology?

A. Yes. Outside plant costs should reflect expected network deployment. For example, an efficient firm serving a given area over time might place a 1200-pair cable along a particular feeder route and supplement it several years later with an additional 1200-pair cable. The appearance of two 1200-pair cables in the projected network design does not mean that the cost study is measuring short-run costs or embedded costs. To the contrary, the placement of two 1200-pair cables reflects efficiency as it must be measured in the real world—the world in which demand growth is uncertain and in which demand growth may (or may not) materialize in specific locations over time.

The cable size input assumptions in Verizon-MA's studies are based on these forward-looking cost principles. As I understand it, Verizon-MA's engineering guidelines call for the company to deploy cable feeder plant to meet expected demand for a period of at least three years. Then, if demand growth or the need to replace outmoded or defective cable will require additional capacity to be deployed, the company will augment its cable plant with an additional cable. This policy is reflected in its cost estimates. Since the policy is one that is expected to be used by Verizon-MA to deploy its network, i.e., the guidelines are expected to remain in place over the planning horizon for its studies, this is the appropriate assumption to apply to cable costs. It is not appropriate to assume that cable will be built to serve all current and future demand at a single point in time. Such an assumption would reduce the *estimated* costs produced by the model; but, if this complete-replacement theory were applied in reality, costs would be higher for at least three reasons:

1. if the estimated demand did not materialize because growth in any geographic area was not as large as expected, then the firm would wind up with excessively sized and wastefully expensive plant;

2. if technology changed, then the firm would have to replace a more expensive cable than it

would have if the smaller cable had been used; and

3. even if demand and technology evolve as expected, carrying costs would be higher during the period in which the oversized/underutilized cable is in place.

Q. Has the Department recognized these forward-looking principles?

A. Yes. In the *Phase 4 Order*, the Department found:

> Although [a] network may be viewed as 'dropped in place,' it will presumably exist beyond the moment it is dropped in place.[16]

Q. Do the Verizon-MA studies follow the forward-looking, long-run methods you describe above?

A. Yes. The Verizon-MA models take the most efficient technologies currently available and deploys them using current wire center locations consistent with expected future capital investment programs. Thus, it is consistent with the FCC's concept of "forward-looking economic cost methodology based on the most efficient technology deployed in the incumbent LEC's current wire center locations."[17]

Furthermore, the Verizon-MA models use a long-run period, in which all of a firm's costs are variable. Thus, it is consistent with the FCC definition of the long-run:

> The term 'long-run,' in the context of 'long run incremental cost,' refers to a period long enough so that all of a firm's costs become variable or avoidable.[18]

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[16] D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 – Phase 4, *Consolidated Petitions of New England Telephone and Telegraph Company d/b/a NYNEX, Teleport Communications Group, Inc., Brooks Fiber Communications, AT&T Communications of New England, Inc., MCI Communications Company, and Sprint Communications Company, L.P., pursuant to Section 252(b) of the Telecommunications Act of 1996, for arbitration of interconnection agreements between NYNE and the aforementioned companies*, December 4, 1996, at 32 ("*Phase 4 Order*").

[17] *Interconnection Order* at ¶ 685.

[18] *Interconnection Order* at ¶ 685. See, e.g., William Baumol, *Economic Theory and Operations Analysis* 290 (4th ed. 1977) ("The very long run is a period so long that all of the firm's present contracts will have run out, its present plant and equipment will have been worn out or rendered obsolete and will therefore need replacement, etc.")

Q. Do the studies address the requirement to use forward-looking cost of capital and depreciation?

A. Yes. The Company's use of forward-looking cost of capital and depreciation is addressed in the testimonies of Dr. Vander Wiede and Mr. Sovereign respectively.

Q. Do the Verizon-MA models use existing wire center locations, as required by the FCC?

A. Yes. The Verizon-MA models assume wire centers at existing locations, and deploys the most efficient technology as is consistent with the FCC *Interconnection Order*:

> [P]rices for interconnection and access to unbundled elements would be developed from a forward-looking economic cost methodology based on the most efficient technology deployed in the incumbent LEC's current wire center locations. This approach mitigates incumbent LECs' concerns that a forward-looking pricing methodology ignores *existing* network design, while basing prices on efficient, new technology *that is compatible with the existing infrastructure*. *This benchmark of forward-looking cost and existing network design most closely represents the incremental costs that incumbents actually expect to incur in making network elements available to new entrants.*[19]

Thus, the FCC concludes:

> ...that the forward-looking pricing methodology for...network elements should be based on costs that assume that wire centers will be placed at the incumbent LEC's current wire center locations, but that the reconstructed local network will employ the most efficient technology for reasonably foreseeable capacity requirements.[20]

The Department interpreted this rule in the 1996 arbitration proceedings:

> We believe that the FCC, in requiring that existing wire centers remain unchanged, was trying to rationalize a forward-looking technology approach to cost with the *reality of the physical distribution of existing customers* and central offices.[21] (emphasis added)

[19] *Interconnection Order at* ¶ 685 (emphasis added).

[20] *Interconnection Order* at ¶ 685.

[21] *Phase 4 Order* at 14.

Accordingly, the methodology Verizon-MA applied in its cost studies is consistent with both the FCC's TELRIC principles and the previously accepted standards of the Department.

Q. Has the Department recognized that forward-looking cost models should reflect more realistic network configurations and inputs?

A. Yes. In the *Phase 4 Order*, the Department clearly discouraged networks based on "a trigonometric view of the world."[22] For example, the Department stated:

> The creation of the outside plant based on [population data] is unrealistic because, in essence, the model is placing houses and business where they do not currently exists...there are at least some circumstances in which this formulation will be far afield of the actual manner in which a local distribution system will be built….[such a model] has the clear potential, given the configuration it adopts, to present skewed results with regard to local loop plant investment.[23]

Q. Is Verizon-MA's approach to common overhead costs consistent with the FCC's rules?

A. Yes. As the FCC recognized, it is appropriate to estimate and include forward-looking common overhead costs as part of the economic costs of network elements. As I understand it, the Verizon-MA approach estimates forward-looking common costs and is, therefore, consistent with the FCC's *Interconnection Order* and sound costing principles.

Q. Is the Company's reliance on Telcordia cost models appropriate?

A. Yes. I believe Verizon-MA's reliance on the Telcordia cost models is appropriate. Telcordia cost models use an economic incremental cost approach to determine costs for network elements, and thus are consistent with economically sound costing procedures. The Switching Cost Information System ("SCIS"), for instance, is a widely employed switch model that can take account of both detailed engineering characteristics and anticipated transaction prices at which switches are purchased by a particular LEC. I can, in fact, testify to the suitability of SCIS based

[22] *Phase 4 Order* at 21.

[23] *Phase 4 Order* at 21.

on first-hand experience. In early 2000, I participated in a review of SCIS and the development of a white paper in which we explained the economic principles underlying SCIS and CCSCIS (another Telcordia model).[24] In the paper we also demonstrated that these models are consistent with the rules and principles used by regulators to determine the costs associated with network elements and interconnection. We examined the models by examining their descriptions, and in the case of SCIS, comparing key algorithms and equations to the requirements of the capacity cost approach to costing. Based on this review, we concluded that with accurate physical descriptions of the facilities being analyzed and reasonable estimates of input prices and demand, these models produce economically valid network cost estimates that are appropriate to support regulatory decisions.

Q. Are the Telcordia cost models used by Verizon-MA in this proceeding the same models adopted by the Department in the Phase 4 Order?

A. Yes. The switching cost models used by Verizon-MA in this proceeding are the same switching cost models used by NYNEX—and approved by the Department—in the arbitration proceedings. In those proceedings the Department found that there is "no reason to believe that [SCIS] does not produce reasonable outputs."[25] There is no reason to deviate from the finding in that proceeding because the current cost models are not materially different from those used in the arbitration proceedings.

V. ESTIMATING THE NON-RECURRING COST OF UNBUNDLED NETWORK ELEMENTS

A. Basic Steps to Estimate Costs

Q. What are the basic steps required to estimate the LEC's forward-looking economic costs for non-recurring elements?

[24] National Economic Research Associates , *An Economic Evaluation of Network Cost Models*, April 7, 2000.

A. Estimating the non-recurring costs of network elements involves three basic steps:

1. Estimate how long it takes to perform the non-recurring activities;
2. Calculate the costs of labor for performing the non-recurring activities; and
3. Estimate the forward-looking common costs associated with each network element.

B. Applying the FCC Approach to Non-Recurring Cost Estimation

Q. What are the basic TELRIC guidelines that the FCC set out for estimating the non-recurring cost of elements?

A. The same basic costing guidelines that applied to recurring costs also apply to non-recurring costs including the facts that TELRIC should:

- be forward-looking,[26]
- include directly attributable costs for the entire increment of the element,[27] and
- use forward-looking cost of capital.[28]

In its discussion of "Rate Structure Rules" the FCC offered additional guidelines to help state commissions set rates for non-recurring elements. Specifically, the FCC stated that non-recurring rates should:

- not recover any recurring costs,[29]
- be imposed equitably among entrants.[30]

Q. What must be done to estimate TELRICs for UNEs that are consistent with these

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(...continued)

[25] *Phase 4 Order* at 36.

[26] *Interconnection Order* at ¶ 694-698.

[27] *Interconnection Order* at ¶ 690.

[28] *Interconnection Order* at ¶ 700.

[29] *Interconnection Order* at ¶ 745-746.

[30] *Interconnection Order* at ¶ 750.

principles?

A. A forward-looking TELRIC assessment of non-recurring elements should:

1. Estimate costs for the forward-looking process to be deployed using the most efficient methods and practices for current, actual activity. Thus, the study should use costs for labor based on current company practices regarding currently used practices adjusted to capture anticipated changes in company practices, and anticipated inflation or deflation. This approach would capture both:

    - currently anticipated changes in labor rates; and
    - currently anticipated and expected technological improvements in processes.

2. Develop cost factors based on forward-looking, company-specific debt-equity ratios, debt costs and equity costs.

In addition, the study should assign shared fixed and common costs in as economically efficient a manner as possible.

C. Verizon-MA's non-recurring cost study is consistent with the economically appropriate application of the FCC approach.

Q. Have you reviewed Verizon-MA's methodology for calculating non-recurring costs for UNEs?

A. Yes. I have reviewed Bruce Meacham's prefiled testimony and understand that Verizon-MA developed a non-recurring cost (NRC) model to estimate forward-looking costs for the service order processing and provisioning of non-recurring functions associated with each UNE. Verizon-MA estimated the amount of time expected to be required in the future to perform each work activity involved to fulfill a CLEC's service request.

Forward-looking time estimates for a non-recurring service were obtained by:

1. determining how long it takes to complete the work activities associated with non-recurring services;
2. determining the probability that any specific work activity is necessary to fulfill the demand for a particular non-recurring service—the *occurrence factors*;

3. using the occurrence factors and current work activity time estimates to determine the amount of time required to fulfill the demand for a particular non-recurring service; and
4. submitting those time estimates to a review by subject matter experts to determine if a particular work activity can be expected not to take place in the future or if it does occur, the extent to which forward-looking technology would reduce the amount of time required to conduct that work activity in the future.

These forward-looking time estimates are multiplied by the appropriate projected labor rate, marked up by a common cost factor and a gross revenue loading factor (intended to measure taxes, fees and uncollectibles associated with non-recurring revenue) to determine the price of each non-recurring service.

Q. Is the Verizon-MA non-recurring cost study consistent with the FCC's methodology?

A. Yes. The Verizon-MA non-recurring cost study has the essential characteristics mandated by the FCC *Interconnection Order*: it is based on directly attributable costs (follows the principles of cost recovery), is forward-looking, is long-run, includes a forward-looking cost of capital, and includes a reasonable allocation of shared and common costs.

Q. Does the Verizon-MA study follow the forward-looking, long-run method you describe above?

A. Yes. The Verizon-MA model uses a long-run period, in which all of a firm's costs are variable. For purposes of estimating activity-based non-recurring TELRICs, this assumption takes into account the planned and anticipated automation of tasks, and the planned and expected improvements in activity performance. Specifically, Verizon-MA's NRC cost study:

1. takes into account all efficiencies reasonably achievable as a result of the deployment of forward-looking technology;
2. includes only the one-time tasks required to establish a service or feature, or to provide an element;
3. assumes the elimination of those tasks required today to perform similar functions, but not anticipated to be needed once forward-looking technologies are fully deployed; and
4. reflects expected savings due to improved systems and methods and the effects of the learning curve.

Q. Does the study exclude the recovery of recurring costs as required by the FCC?

A. Yes. The Company's cost study follows the principles of cost recovery. The NRC model only recovers the one-time costs associated service order processing and provisioning of non-recurring functions associated with each UNE.

Q. Does the study address the requirement to use forward-looking cost of capital and depreciation?

A. Yes. The Company's use of forward-looking cost of capital and depreciation is addressed in the testimonies of Dr. Vander Weide and Mr. Sovereign respectively.

Q. Is the common overhead approach used by Verizon-MA appropriate for use in a study of network element costs?

A. Yes. As the FCC recognized, it is appropriate to estimate and include forward-looking common overhead costs as part of the economic costs of network elements. As I understand it, the Verizon-MA approach estimates forward-looking common costs and is, therefore, consistent with the FCC's *Interconnection Order*.

Q. Does the Company's study include any costs other than forward-looking economic costs?

A. No. Consistent with the FCC *Interconnection Order*, the Company's cost study does not include historical (embedded) costs, opportunity costs, universal subsidies or retailing costs.

Q. Would it be appropriate from an economic perspective to permit recovery of these costs?

A. Yes. These are real costs to the company, and the company must recover them from its services. (Note, however, that retailing costs avoided when the company sells network elements should not be included in the rates for network elements.) But again, the Company's study conforms to the FCC's rules and does not include such costs.

Q. Does this conclude your testimony?

A. Yes.