Costs and Profitability of Vermont's Incumbent Telecommunications Carriers

Part 2 of 3 of a Report to the Vermont Department of Public Service

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Executive Summary

This is the second of three reports that Rolka Loube Saltzer Associates has agreed to write for the Vermont Department of Public Service. RLSA's first report covered the revenue effects of the FCC's recent *Transformation Order* on incumbent Vermont local exchange carriers. This report examines the costs of providing service in Vermont. In the third and final volume of this report, RLSA will consider a range of economic and policy issues surrounding universal service, including price elasticity, economic development, the effects of competition. We will also offer policy options for Vermont, and one or more recommended support mechanisms.

This second volume responds to the direction in Vermont statute to examine "the costs and other factors affecting the delivery of local exchange service by the incumbent local exchange carriers." We also evaluated profitability. We make the following findings:

- Taken as a whole, Vermont is a daunting place to provide carrier-of-last-resort telecommunications service.
    - Average embedded cost for all regulated and non-regulated operations is $97 per location per month. For regulated operations only, average embedded cost is $81 per location per month.
    - Average forward-looking cost is $58 per location per month.
- Even though there is substantial variation among the seven ownership entities, all seven have high cost when viewed on a national scale. This is true both whether one examines forward-looking cost and when one examines embedded costs. Among the seven ownership groups:
    - As to forward-looking cost:
        - The two owners that have multiple study areas, TDS and FairPoint, also have the lowest costs, but each has costs of at least $52 per location per month.
        - All the other Vermont ILECs have costs of at least $70.
        - Topsham's forward-looking cost exceeds $100.
    - As to embedded cost for regulated operations:
        - The lowest cost company is Shoreham at $62 per location per month.
        - Four Vermont groups have embedded costs higher than $100.
        - FairPoint's embedded cost is $77.

    - The highest cost company is Topsham at $124.

- Most companies have higher embedded cost than forward-looking cost. This is surprising given the advanced age of the installed facilities in Vermont, and could be an indication of carrier inefficiency. Another possible cause could be inaccurate assumptions in the estimation of forward-looking cost. If Vermont ultimately adopts a cost-based support mechanism, it should include some kind of forward-looking cost element.

- In 2011:

  - For regulated operations, all Vermont companies reported an aggregate net operating loss of $39 million. This amounted to $11 per location per month. Three companies that serve 92% of the locations in Vermont (FairPoint, TDS, and VTel) experienced financial losses.

  - Non-regulated operations produced losses of another $6 million, or $2 per location per month. Three companies lost money, and four made small profits on non-regulated operations. One company earned more than $10 per location per month, and another earned $6 per location per month.

  - On an "all in" basis, the Vermont companies combined lost $45.5 million, or $13 per location per month. Three companies had losses, with one company losing more than $10 per location per month. Four companies had profits, and two earned more than $10 per month.

- In 2013, RLSA predicts:

  - For regulated operations, all Vermont owners except Waitsfield will experience losses. In aggregate, the statewide predicted losses are $64 million, or $18 per location per line. The causes of this worsening situation were more fully described in Volume I of this report.

  - On an "all in" basis, Vermont owners will have an aggregate operating loss of $70 million. Only two owners are predicted to make a profit in 2013. One of those is predicted to have a profit of $16 per location per month, and the other only $1 per location per month. The remaining five owners are predicted to lose money, and one of those is predicted to lose $24 per location per month.

  - RLSA predicts an aggregate statewide EBITDA of less than $1 million on an "all-in" basis. This amounts, when rounded, to $0 per location per month.

- In the aggregate, Vermont ILECs' telephone plant is more than 90% depreciated. This indicates that the average company has not been investing heavily in recent years.

- Vermont ILECs vary considerably in the age of their installed facilities and, accordingly, in their depreciation and capital expenditure statistics.

  - Franklin and Topsham have low accumulated depreciation and high net investment per location. This suggests substantial recent investments as well as challenging service areas.

  - The two FairPoint and three TDS companies have highly depreciated plant assets and low net investment per location. This suggests that these companies have not recently made substantial investments in upgrading their networks.

  - In 2011, several Vermont ILECs invested more in their networks than they claimed in depreciation expense. These were Franklin, OTT(Shoreham), VTel and Waitsfield. FairPoint was nearly at the break-even level. TDS and Citizens (Topsham) invested substantially less than their depreciation expense.

Contents

I. Overview

This is the second of three reports prepared by Rolka Loube Saltzer Associates under contract to the Vermont Public Service Department. The report is required by Vermont statute. 30 V.S.A. § 7515(b). This report examines the costs of providing service in Vermont. This task involves modeling costs using a computerized cost model of forward-looking network costs, and analyzing the carriers' current cost of service.

RLSA's first report covered the revenue effects of the FCC's recent *Transformation Order* on Vermont Incumbent Local Exchange Carriers ("ILECs").

RLSA's third and final report will consider a range of economic and policy issues surrounding universal service, including price elasticity, economic development, the effects of competition, policy options for Vermont, and one or more recommended support mechanisms to support universal service and rural economic development while securing the benefits of telecommunications competition for Vermont households and businesses.

This second report responds to the direction in Vermont statute to examine "the costs and other factors affecting the delivery of local exchange service by the incumbent local exchange carriers." Part II below discusses definitional issues involving cost. Part III provides some background information on Vermont ILECs. Part IV discusses the "forward-looking costs" of incumbent Vermont carriers, including the pattern of those costs. Part V then makes findings about "embedded" costs of those carriers. Part VI summarizes the cost data from the preceding two parts. Part VII discusses the profitability of those carriers. Part VII contains overall conclusion.

II. Background and Terminology

The Vermont statute requires consideration of:

> *how various factors affect the costs of providing telecommunications service in Vermont and elsewhere, estimate the current costs and estimate, on a forward-looking basis, the differential costs of providing local exchange service to various customer groups throughout Vermont.*

The two components of cost are capital cost for net capital investment (such as cable and wire and central office equipment) and annual operating cost (primarily personnel and consumable materials). Capital cost is typically calculated as a percentage of net investment rather than a company's actual debt and equity cost. Operating cost is typically estimated as a function of company size.

A. Average and Incremental Costs

In universal service parlance, "cost" ordinarily means unit cost or "average cost." This is an aggregate cost over a geographic area divided by some measure of the units served within that area and further divided by a unit of time. Typically, average cost has been expressed in units of dollars per location per month. In such an average cost report, all customers within the geographic area are assumed to be equally costly to serve.

The financial health of any business is determined by the balance between its revenue and its cost. But in the wireline telecommunications business cost is only minimally affected by subscribership. ILECs historically have built ubiquitous networks that serve all or nearly all locations within a defined service area. For these "Carrier of Last Resort" networks, costs are determined largely by geographic factors, including the size of the area to be served, the number of locations to be served,[1] and the level of service desired (Internet or voice). Therefore it is possible to predict a carrier's costs without considering subscribership as a principal factor.

Revenue, on the other hand, depends almost entirely on subscribers. A company without subscribers has neither direct subscriber revenue nor indirect revenue from other carriers ("access" payments). Even if costs are know precisely, an ILEC's *survival* will depend very much on its success in attracting subscribers and earning revenue based on services to those subscribers.

In calculating average cost, the FCC and states have traditionally used "switched[2] subscriber lines" as the denominator. Switched lines worked well historically, since at one time nearly every residence contained a switched phone line from the monopoly landline provider, and those few customers who declined the service were scattered randomly. More recently, however, actual subscriber counts have begun to fluctuate over time and from one location to another. Many residences today do not subscribe at all to wireline telephone service, and subscribership depends strongly on both the extent of competition in the neighborhood and on the ILEC's own performance history. Nevertheless, a carrier of last resort must still build a network capable of serving every location in its service area, even if the occupant is not a subscriber.

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[1] Most telephone company costs are fixed, and are determined by the capital and maintenance needs of its installed network. Some costs are variable to customers, such as the size of some feeder and distribution cables and customer-services. But variable costs are a small portion of total cost in the telecommunications industry.

[2] "Switched" here means that the loop is connected to a switch at the central office that can connect the subscriber's phone using dialed numbers. Another feature of a switched line is that it offers a "dial tone." "Switching" can be performed using a variety of technologies, including mechanical switched and computers. More recently, "soft switches" use IP packet protocols to perform traditional switching functions. The use of IP switches is part of the ongoing evolution of technology and does not alter the fact that the telephone network is a public switched network.

In this new environment, the number of "locations" served is a more appropriate denominator for the purpose of determining the cost of a COLR network and therefore of universal service support requirements. Cost per location more accurately measures the cost of operating a network that can provide service to all potential customers. Per-location cost is also more stable than per-subscriber cost as competitors come and go and as customer preferences evolve. More importantly, per-location cost is appropriately sensitive to the geographic and environmental factors while being appropriately insensitive to transient factors arising from local competitive conditions and the ILEC's historical success with its own customers. In sum, cost per location per month is the most reliable way for a regulator to estimate the financial difficulty of the task imposed on a carrier of last resort that must construct and operate a ubiquitous telecommunications network.[3] In the following pages, RLSA reports average cost solely on a per location basis.

"Incremental cost" is a different concept. It is the additional cost created by an additional unit of demand. That additional unit could be a service, a customer, or a portion of the network. For example, the incremental cost of one new customer is the extra cost that a company incurs when it adds a single new customer. Ordinarily, this cost is small, consisting of a capital investment for the "drop" wire to the customer's premises and some minor electronics. These incremental costs of serving a new customer are minor compared to the common costs[4] of purchasing central office equipment and the cost of building a distribution network that passes the front yard of every potential customer. For this reason the incremental cost of a new customer is seldom used in universal service discussions and is not used in this report. Other kinds of incremental cost are useful, but in other regulatory contexts.[5]

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[3] Economic and competitive conditions affect profitability by reducing revenue and increasing the average cost of service. For a forward-looking cost model, the average cost per location could be higher than the total cost per subscriber line because larger cables and electronic equipment are required when the model assumes service is provided at every location. However, the average cost per location could be lower than the average cost per subscriber line because the additional costs would be more than offset by the loss of customers.

[4] Common cost is the cost of capital equipment and labor that is necessary to serve all or any customer. Common cost is the cost of capital equipment and labor used to provide multiple services or to provide the same service to multiple customers. The FCC noted, in a broadband network, that "a copper loop can be used to provide analog voice service as well as data service using DSL technology. The cost of the loop is therefore common to both voice and DSL service. The incremental cost of voice service, assuming that DSL is already provided, does not include any of the long run incremental cost of the loop itself." *In the Matter of High Cost Universal Service Support*, Further Notice of Proposed Rulemaking FCC No. 05-337, released November 5, 2008, Appendix A, ¶ 247. In addition, central office and interoffice facilities costs are common to all customers. While these common costs can increase when there are more customers, whatever is in use is used in common for the benefit of all customers

[5] Regulators sometimes use "total element long-run incremental cost" (TELRIC) for setting wholesale prices. This is the incremental cost of an entire segment or "element" of the network such as a loop or a switch. The word "total" implies change or incremental difference between not providing the element and all of the current demand for the element. Therefore, TELRIC cost is the incremental cost of increasing the units of demand of a network "element" from zero to the actual demand. For example, the

B. Embedded and Forward-Looking Cost

A perennial universal service debate is whether it is better to measure costs by the actual costs of the network currently serving customers or to estimate cost using a "model" that standardizes certain features of the network. The first option produces "embedded" costs. The second option produces "forward-looking" costs (also called "forward-looking economic costs" or "FLEC").

Embedded costs are based on a company's accounting records, and reflect the historical costs of the actual network. Embedded cost includes the company's cost of capital reflecting its actual investment added to its actual operating cost. The rules to calculate embedded cost are often similar to the rules to calculate "revenue requirement" under traditional rate-of-return regulation, and they usually include uniform accounting policies and depreciation rates.

Embedded costs reflect the technologies in use at the time that equipment was actually purchased. Because real networks purchase equipment over time, embedded costs therefore usually reflect a mix of technologies, including older circuit switching equipment and newer Internet Protocol switching equipment. Embedded costs also reflect materials and labor cost at the time of acquisition.[6]

Embedded costs reflect the spending choices of individual companies. Therefore, if universal service support is based on embedded cost, support will generally change in the same direction that a supported company changes its spending pattern. This support response can be beneficial if it creates an incentive to invest in essential equipment or better quality control. This support response can also encourage excessive spending on both capital assets and operating expenses. It has often been said that basing universal service support on embedded costs can lead a company to make excessive investments ("gold plating" the network) and to have excessive operating expenses.[7]

Forward-looking economic cost is the cost of building a new network capable of providing the desired service. In economic terms, FLEC is very similar to what economists call "long-term incremental cost." The increment in this case is the network that serves a given area such as an exchange. "Long-term" means that capital costs are included.[8]

TELRIC of a loop is the total incremental cost of a network with loops minus a network without loops, and divided by the number of loops.

[6] For example, if a company purchased a telephone pole in 1970 for $200 and another pole in 2012 at $500, then the total gross investment would be $700.

[7] In regulatory economics, the tendency to build more costly facilities is called the Averch-Johnson effect.

[8] For example, if the carrier needed two telephone poles and the current price is $500, then the forward-looking cost of two poles would be $1,000. But the embedded cost of two poles depends on when the poles were purchased. If one pole was purchased in 1990 for $250 and the second pole was purchased in 2000 for $400, then the embedded cost of the two poles would be $650.

Forward-looking costs are produced by computer "cost models." A model typically takes a given telephone exchange area and designs a "virtual" telecommunications network to serve it. Ordinarily, the model designs a virtual network that could serve every location in the exchange area. Thus a cost model essentially replicates the decisions that an engineer would make in planning and estimating the costs of a new network. The cost model outputs show the component costs of such a network.

The forward-looking cost of a network assumes the best current technology. Therefore, a forward-looking model run today would evaluate the cost of a network equipped with Internet Protocol switches. The model would not employ any circuit switches, even though 99 percent of the switches currently in use might be circuit switches.

To define the best available technology, one must first decide what type of services the network should be able to provide. For example, the best available technology to provide only voice service is different from the best available technology that can provide voice, data and video services.

All cost models rely on some real-world geographic facts. At minimum, all models rely on the actual location of existing telephone company central offices. These are called "greenfield" models. Some models go farther and incorporate other real-world geographic facts about existing networks such as the locations of feeder lines, the existence of aerial cable or whether the cable is copper or fiber optic. These are called "brownfield" models.

Forward-looking models can estimate cost at a geographic scale that is smaller than the exchange, such as the census block. This can be useful in universal service programs, particularly those that seek to target support to exchange or sub-exchange areas. Common criticisms of forward-looking models are that they can overly simplify the real environment, that they are insensitive to unique local conditions, and that they are susceptible to hidden manipulation by policymakers.

The forward-looking cost in any exchange or company can be lower than the embedded costs, particularly during times of declining capital costs.[9] Forward-looking costs are also lower when a company's embedded costs are inflated due to extraordinary external circumstances (like permafrost) or by internal decisions such as incurring unnecessary capital or operating costs.

Forward-looking cost for any exchange or company can be higher than the company's embedded costs if the existing network is old and highly depreciated, if the forward-looking model virtually constructs a virtual network of higher quality than the embedded network,[10] or if the costs of materials and labor have increased since the actual network was installed.[11]

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[9] This was the case during the 1990s, when central office equipment costs plunged dramatically.

[10] Modern cost models tend to build networks capable of providing DSL-quality broadband service. This generally requires thicker and shorter copper wires than voice networks, as well as additional electronics located in remote locations outside the central office.

[11] Both copper and labor costs have increased over the past decade.

Forward-looking model costs do not reflect the spending choices of individual companies. Therefore, if universal service support is based on forward-looking cost, the support does not change as the supported company changes its spending patterns. This support response can be beneficial if it induces a company to eliminate wasteful spending. Conversely, this same support response can create an undesirable incentive to cut costs "to the bone," thereby avoiding new investment that is necessary and compromising maintenance and service quality.[12]

To fully respond to the 2012 Legislature's request to be informed about the "costs" of providing service in Vermont, RLSA examined both the embedded and forward-looking costs of Vermont incumbents. Part IV below discusses forward-looking costs. Part V below discusses embedded costs.

C. Geographic Scale

Cost in the telecommunications industry can vary by geographic scale due to customer density, geographic features and other economic and demographic characteristics. Historically, costs have been measured or reported as averages over large areas. More recent universal service efforts, however, have used smaller scales to report cost data. Six geographic scales are discussed below in roughly declining order of size.

1. The "study area." A study area generally is a particular telephone company's service territory in a single state. Sometimes a single parent company can have multiple study areas in a state.[13] Study areas can have millions of lines, or only a few hundred, depending on the location and the size of the telephone company. The study area is usually the only scale at which embedded costs can be meaningfully calculated because companies keep their books on a company-wide basis.

2. The "UNE Zone." The federal Telecommunications Act of 1996 mandated that certain ILECs provide "unbundled network elements" ("UNEs") to competing telecommunications carriers. For example, Sovernet has the ability to buy a "loop"[14] in areas of Vermont from FairPoint NNE and according to a pricing methodology prescribed by the FCC. As required by FCC rule, FairPoint NNE has three UNE zones in Vermont. The Urban Zone consists of two exchanges. The Suburban Zone has 21 exchanges. The Rural Zone has 69 exchanges.[15]

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[12] Service quality for voice service is regulated in multiple ways, and other policies can constrain this tendency to cut costs and reduce service quality.

[13] Vermont has ten study areas, including three operated by the TDS companies and two operated by FairPoint.

[14] A "loop" is connection from a central office to a customer's location. Usually loops are pairs of copper wires.

[15] This number includes 10 Vermont exchanges that are served from central offices in adjacent states.

UNE prices vary by zone, with the highest prices in the Rural Zone. Vermont's rural carriers do not have UNE zones. [16]

3. The "exchange" or "wire center." A "wire center" means the building into which an area's telephone lines are concentrated. The term is also used to mean the area served by those lines. The original meaning of "exchange," the area reachable by a "local" telephone call, is largely obsolete. Today an "exchange" is a service area that often comprises a single wire center area, but sometimes contains two or more wire centers. Vermont has 148 wire centers and 135 exchanges. Although modern telecommunications equipment and policies have reduced the importance of historical telephone exchange boundaries, the exchange persists as a popular unit for routing calls and for measuring costs.

4. The "census block." A census block is a small geographic unit defined by the United States Census. Generally, census blocks are small in area; for example, a block bounded by city streets, but census blocks in remote areas may be large and irregular.[17] Vermont has 32,580 census blocks, some of which have no population.

5. The "customer serving area." A customer serving area is an area that a computerized cost model assumes can be served by a single electronics cabinet. Generally, these models design networks that can provide broadband service to all customers. [18]

6. Individual customer location. Modern cost models can produce an average cost over an area smaller than that at which the model designs facilities. These costs reflect not only the incremental cost of adding a customer to an existing distribution route, but also reflect an allocated share of common exchange costs such as central office equipment, feeder and distribution cable.

The 2012 Vermont statute does not identify the scale at which costs should be estimated differentially. Unfortunately, two basic principles are at odds.

The first principle is that competition drives cost measurement towards a fine geographic scale. Although some costs (such as central office switches) are commonly allocated in equal shares to all subscribers, other costs are location-specific. In low density areas, customers are

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[16] Under the Act, any ILEC can be compelled to sell UNEs. In general, however, rural ILECs have benefitted from an exemption and have not been required to sell UNEs.

[17] Census blocks are areas bounded on all sides by visible features, such as streets, roads, streams, and railroad tracks, and by invisible boundaries, such as city, town, township, and county limits, property lines, and short, imaginary extensions of streets and roads. For example, one Vermont census block near the State House is bounded by State Street, Elm Street, Court Street, and Governor Davis Avenue.

[18] Cost data can be but seldom are reported by serving area.

widely spaced, which increases average cost.[19] Also, some customers at the edge of a large rural exchange are served by many miles of telephone cable. Before 1996, these cost differences could be ignored, and all customers generally paid the same rates. The result was that customers in low-cost areas were "high-surplus" customers who contributed more toward common costs than rural high-cost customers.

Because the portion of such a rural exchange that has high average cost is typically at the edge, these areas are often characterized as "donuts" in universal service parlance. Likewise, a competitive or low-cost area near the central office is often called a "donut-hole."

In 1996, the Congress decreed that local exchange markets will be competitive.[20] Under this law, competitors have been free to build facilities, or not, consistent with their economic interests. New competitors have no Carrier of Last Resort obligations. They naturally seek out donut-hole areas where costs are lowest and where the incumbent's economic surplus is largest. In particular, cable companies and competitive local exchange carriers (CLECs) typically serve only densely populated central areas with low costs. As a result, a single modern exchange can contain multiple sectors, only some of which are competitive.

The arrival of competitors greatly changes the ILECs prospects, particularly if the competitor offers a better service or a lower rate.[21] Moreover, Vermont ILECs have not "deaveraged" their rates to charge more in the donut areas, and this may have sharpened opportunities for their competitors. Whatever the reasons, most Vermont ILECs have lost subscribers in recent years, particularly in areas with cable competition. If universal service support is going to respond to economic reality, it must operate at a scale at least as fine as that which controls the supported company's business prospects. A comprehensive universal service policy therefore needs fine-scale sub-exchange information not only about cost, but also about the extent of competition.

Fine-scale data can also be used for other policy purposes as well, such as excluding certain areas eligible for support. This is called "targeting" in universal service parlance. Before

[19] The following hypothetical example illustrates why density is such an important factor in telephone costs. Suppose there are two one mile segments of road. One segment has 80 customers and the other has 20 customers. The capital cost of constructing a one mile pole network is the same for both segments, approximately $14,000. The cost of distribution cable, drop wire and terminating equipment varies with the number of customers. For 80 customers, these costs might be $11,000. For 20 customers, these costs might be $3,000. The total cost for 80 customers is $25,000 and the total cost for 20 customers is $17,000. The average investment per customer for the 80 customer route is $312 (=$25,000/80). This is much lower than the average investment per customer for the 20 customer route of $871 (=$17,000/20).

[20] This federal law preempts any contrary state law. *See* 47 U.S.C. § 253.

[21] Cable companies have a purchasing power advantage over rural telephone carriers for video content. Therefore, cable companies may earn substantially higher profits on video services and may be able to use these profits to reduce their telephone service prices.

2000, federal USF programs measured cost at the study area scale. [22] More recently, the FCC has tried to target federal support to smaller geographic areas using census blocks as a finer measurement scale. The FCC has said that certain donut-holes will be ineligible for support, in this case defined by the presence of an unsubsidized competitor, rather than cost. Also, the FCC plans to limit support to very high cost portions of high-cost exchanges. These very high cost areas will be eligible for support only from a new "Remote Areas Fund" that appears likely to be under-funded.

The second and opposing principle is that efficiency drives cost reporting toward larger scales. Almost no general purpose wireline telecommunications networks serve very small areas. The simple reason is that economies of scale prohibit small networks. Due to the sharing of equipment and facilities, a network serving a larger geographic area will have lower average cost. For this reason, any cost report for a small (sub-exchange) area is often not meaningful.

Computerized forward-looking cost models can report average costs at a finer scale, but these results are artificial. The models typically construct cost estimates at the exchange scale. To report unit cost at a finer scale requires the model to sub-allocate from those exchange level cost estimates. Although the result may be precise, they are not financially meaningful. It is not generally possible to operate a small network at a cost level equal to the allocated share of the costs of a larger and more efficient network.

The greater efficiency of larger networks also can create an apparent regulatory paradox. A state may seek to conserve USF funding by "targeting" support and eliminating support to donut-holes (either defined by competition or low average costs). Yet once the donut-hole is excluded from the cost model, the residual donut area may be found to have very high cost. The apparently paradoxical effect is that excluding the donut hole can increase the apparent need for support. This is not really a paradox because excluding the donut hole the calculation in a cost-based support system is actually a statement that explicit support should replace the implicit economic surplus previously earned from customers in the donut-hole.

In this report, RLSA reports cost at both the study area and the exchange level. Embedded cost data are only reported at the study area level, since no finer scale is possible. For forward-looking model costs, RLSA reports results at exchange area, the study area, and the holding company level. This approach reflects a compromise between the two conflicting principles described above. The resulting reported cost data aptly illustrate the range of average costs in Vermont from one area to another, and this should help policy makers understand the range of costs that incumbents encounter in Vermont and what areas of the state are high cost areas. At the same time, the data retain most of the economies of scale in actual existing networks.

[22] Since January 1, 2000, large non-rural carriers have received support based on statewide average costs, while rural support programs remained primarily based on study area costs.

D. Subsidies and Common Costs

Conceived broadly, there is only one central issue in modern universal service policy debates: How much explicit support should government funds provide to incumbent carriers that are losing their traditional revenue? Competition has given this question a much sharper focus by causing the rapid erosion of certain kinds of traditional revenues. Historically, incumbent local exchange carriers charged nearly uniform rates for all retail customers. Some have characterized these traditional arrangements as creating "implicit subsidies" from urban customers (who had low average costs) to rural customers (who had high average costs).[23]

Regardless of title, the lower costs in urban communities created an opportunity for new entrants. CLECs customarily serve serving only low-cost urban areas, which means they compete mainly for customers whose rates from the incumbent are well above average cost in that area. Moreover, business lines tend to concentrate in high-density areas, and ILECs have historically charged higher rates for business customers, thereby accentuating their competitive disadvantage in low-cost areas.

Accordingly, much of the competitive wireline and wireless entry after 1996 has been in high-density and low-cost areas. New entrants have often been able to win over a large share of the incumbents' customers. That in turn has undercut the revenues of incumbent carriers in those same high-density areas, reducing contribution to common cost and precipitating discussion about the need for universal service support.

E. Regulated, Lightly Regulated, and Non-regulated Operations

In the classical model of utility regulation, all utility services were subject to rate regulation of roughly the same types. Over the last 35 years, state and federal regulators have found many ways to differentiate services, creating numerous categories for special treatment or outright deregulation. The result has been multiple classes of "non-regulated" or "differently regulated" services, each with a different history. The 1980s saw the deregulation of "inside wiring" for a customer's house, for the manufacture of telephones, and for "yellow page" directory listings. In the 1990s, long-distance or "toll" services became lightly regulated and competitive. ILECs began to offer these services through affiliates, and even though the services were still nominally "regulated," financial reporting became more complex. In the 2000s, broadband services were deregulated by the FCC in a quite different legal way than the 1980s deregulated services.

This historical categorization of service complicated our task. Regulated activities are subject to a uniform accounting system, but not non-regulated activities. Likewise, there is no

[23] In economics, the word "subsidy" has a narrower meaning, in which the customer receiving the subsidy pays less than incremental cost of the service purchased. Generally, that was not true in telephone networks, because incremental cost for any individual service in telecommunications networks is generally very low. A more proper characterization of rate averaging would be that the rural customers made smaller contributions to common costs than urban customers.

established accounting and reporting system for non-regulated activities, in Vermont or elsewhere. Accordingly, it is not always possible to distinguish between intra-company transfers and external costs. Third, some Vermont ILECs offer toll and broadband through affiliates, while others offer these services directly through their ILEC. Finally, some ILECs offer cable television services, but others do not.

RLSA divided its financial work using two different systems. For initial data collections from the companies, RLSA differentiated between telecommunications operations conducted by incumbent local exchange carriers ("ILECs") and those conducted by other telecommunications operations.[24] While this method simplified data collection, the variations among ILEC business structure made the results difficult to compare across companies. Therefore, in Part V where we report embedded cost and in Part VII where we report on profitability, we distinguish between "regulated" operations and "non-regulated" operations. In this context, "regulated" means telecommunications operations other than broadband, toll, video, inside wiring, telephone equipment, and yellow pages.

In this report, RLSA's reporting on non-regulated operations is quite limited. One reason is that the many organizational and reporting issues discussed above have made the reported data difficult to compare across companies. Equally important, the ILECs have made much broader claims of confidentiality regarding non-regulated operations. These broad claims have created a tension between the goal of this report, which is to report comprehensively on the ILECs' financial costs and needs, and the goal of respecting confidential data that is commercially sensitive. The confidentiality claims have caused us to generalize the kinds of data we report regarding non-regulated operations, and it has caused major portions of the report to be confidential.

III. The Vermont Incumbents and Their Service Areas

Vermont ILECs operate 10 study areas.

- Franklin Telephone Company, Inc.("Franklin") operates one exchange in northwest Vermont and is family owned.
- Ludlow Telephone Company ("Ludlow") is a two-exchange study area operated by the Telephone and Data Systems ("TDS") of Madison, Wisconsin.
- Telephone Operating Company of Vermont LLC d/b/a "FairPoint Communications" (" Fairpoint NNE" or "NNE") is the largest carrier by far and consists of the exchanges that were formerly served by New England Telephone, then NYNEX, then Bell Atlantic, and then Verizon. NNE serves nearly all of Vermont's major cities and many rural areas, such as Canaan, Island Pond, Jamaica, Morgan, and Troy.

[24] Some ILEC operations are "deregulated." Most Vermont carriers also have deregulated operations conducted by affiliated companies.

- FairPoint Vermont, Inc. ("FairPoint Northland") serves a former GTE study area that includes rural areas such as Cabot, Montgomery, Groton, and Peacham.
- Northfield Telephone Company ("Northfield") is a one-exchange study area operated by the TDS companies.
- Perkinsville Telephone Company, Inc. ("Perkinsville") is a one-exchange study area operated by the TDS companies.
- Shoreham Telephone LLC ("Shoreham") serves a study area in Addison and Rutland counties and is operated by OTT Communications, a subsidiary of Otelco, Inc. of Oneonta, Alabama.
- Topsham Communications LLC ("Topsham") operates one exchange in Eastern Vermont and is a subsidiary of Citizens Vermont Acquisition Corporation, which is affiliated with Citizens Telephone Company of Hammond, New York.
- Vermont Telephone Company, Inc. ("VTel") operates exchanges in southeast Vermont and is family owned. VTel serves the Springfield area, but also has rural exchanges such as Danby and Grafton.
- Waitsfield-Fayston Telephone Company Inc. ("Waitsfield")[25] operates exchanges in central Vermont and the Champlain Valley and is family owned. Waitsfield serves moderate density exchanges like Hinesburg and Waitsfield, but also serves low density exchanges such as Weybridge and Bridport.

The data presented in this section discusses how recent events, especially competition from cable and cellphones, have eroded the subscriber base of several Vermont ILECs. Table 3.1 shows selected base data statistics for the ten Vermont ILEC study areas.

Study Area	Ex-changes	Area (Sq. mi.)	Residen-tial Locat-ions	Total Locat-ions	Locations Without Cable	Resid-ential Lines (2011)	Switched Lines (2011)	Switched Lines (2008)
Franklin	1	24	867	936	851	791	821	853
Ludlow	2	51	3,210	3,500	657	2,904	3,854	4,886
FairPoint NNE	92	4,050	217,987	240,667	69,974	122,207	191,601	265,331
FairPoint Northland	8	216	6,925	7,400	6,081	4,690	5,089	5,927
Northfield	1	54	2,291	2,524	1,073	1,767	2,467	2,776
Perkinsville	1	23	914	947	366	655	744	867
Shoreham	6	143	3,801	4,132	3,742	2,933	3,308	3,523
Topsham	1	85	1,830	1,919	1,919	1,448	1,551	1,597
VTel	14	399	15,135	16,364	4,833	12,937	16,702	19,747
Waitsfield	9	395	16,776	18,180	10,028	15,063	18,311	19,837
Totals	**135**	**5,440**	**269,736**	**296,569**	**99,524**	**165,395**	**244,448**	**325,344**

[25] These companies do business as Waitsfield Telecom and Champlain Valley Telecom.

Table 3.1. Environmental and Market Data on Vermont Study Areas[26]

Table 3.2 displays some ratios that were calculated from the same data. These data help explain in greater detail the economic challenges that incumbents face in each study area.

Study Area	Location Density (locations per sq. mile)	Residential Switched Lines to Residential Locations	Percent Locations with Cable	Percent Line Loss from 2008 to 2011
Franklin	39	91%	9%	4%
Ludlow	68	90%	81%	21%
FairPoint NNE	59	56%	71%	28%
FairPoint NL	34	68%	18%	14%
Northfield	47	77%	57%	11%
Perkinsville	41	72%	61%	14%
Shoreham	29	77%	9%	6%
Topsham	23	79%	0%	3%
VTel	41	85%	70%	15%
Waitsfield	46	90%	45%	8%
Average	**55**	**61%**	**66%**	**25%**

Table 3.2. Selected Ratios for Vermont Study Areas[27]

These Tables and the underlying data demonstrate some important facts. First, Vermont carriers have almost 300,000 locations to serve, about 270,000 of which are residential.

Second, location density varies considerably from one ILEC study area to another. Topsham and Shoreham have location densities below 30 locations per square mile and thus are likely to have the highest average cost of all Vermont ILECs.[28] FairPoint Northland and Franklin have somewhat higher densities, but are still quite sparsely populated. Northfield, Waitsfield, and Perkinsville have about average densities. Ludlow has the highest density and thus might be expected to have the lowest average cost.

Third, approximately two-thirds of the locations in Vermont have access to cable service. Many of these locations are served by competitive providers such as Comcast.

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[26] Source is file *Environmental study area stats.xls*.

[27] Source is file *Environmental study area stats.xls*.

[28] The relationship between cost and density is discussed below in section IV.B.

Cable is most widely available in exchanges with the highest location densities.[29] This is illustrated below in Figure 3.3 and is obviously the result of a legal structure that allows cable providers to limit their networks to densely populated areas[30] and economic facts that impose high average costs in low density areas.

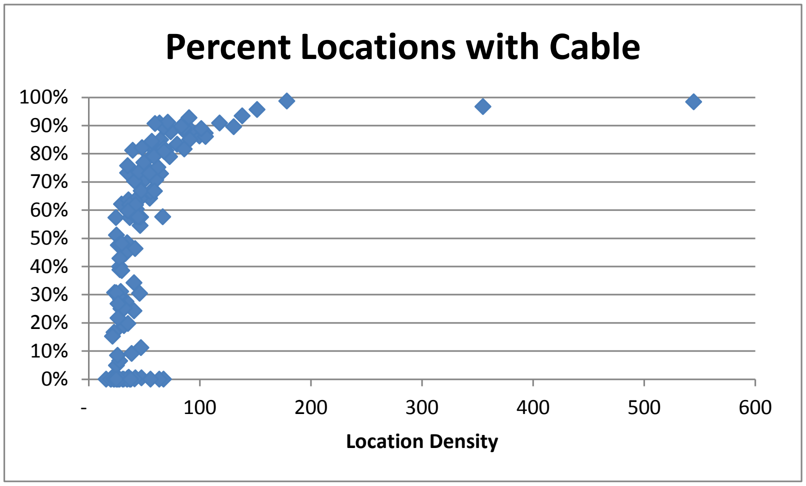

Figure 3.3. Percentage Locations with Cable Versus Density

Viewed on a study area basis, the percentage of locations with cable is also strongly associated with location density.[31] Franklin, Topsham, and Shoreham have little or no cable competition. At the other extreme, Ludlow, FairPoint NNE, and VTel have cable available in at least 2/3 of their locations. Many of these cable-available locations are served by independent cable providers not affiliated with the ILEC.

Fourth, only about 61% of residential locations generate an ILEC switched residential line. Stated the other way, about 39% of residential locations do not have a residential line. This ratio can increase in areas where businesses or residential subscribers take more than one line,[32] and it can decrease as competition erodes the number of subscribers. This ratio is financially important for ILECs because higher subscription ratios generate a lot of additional revenue, but relatively little additional cost.

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[29] The linear correlation of exchange data between location density and percentage of locations with cable is 0.48. As the graph shows, however, a more sophisticated statistical analysis that considers the obvious curve in the data would produce a higher correlation.

[30] *See* Public Service Board rule 8.313(C).

[31] The linear correlation of study area data for location density and percentage of locations with cable is 0.84.

[32] The ratio of residential switched lines to residential locations tends to be high in ski areas, sometimes more than 100%. This could be because these exchanges have condominium phones that qualify as residential switched lines, but without any associated residential locations.

- The exchanges with the lowest ratios of residential lines to locations tend to be those with medium to high location densities.[33] This suggests that ILECs with high-density exchanges, particularly urban exchanges, have lost more customers due to competition.
- The ratio of residential lines to locations varies considerably across study areas. FairPoint's two operating companies are the only companies with a ratio below 70%. Four independent companies have a ratio of 90% or more. This suggests considerable differences among the companies in both their level of competition and in their customer loyalty.

Fifth, switched line subscriber counts declined an average of 25% between 2008 and 2011. This subscriber loss greatly reduces ILEC revenues, but it has little effect on cost. Therefore line loss is an important factor in evaluating the need for universal service support.

- Viewed on a study area basis, the line loss ratio varies considerably. FairPoint NNE purchased these exchanges from Verizon during this period. For that or other reasons, NNE has lost more than one subscriber in four. In the same period, Ludlow lost about one subscriber in five. At the other extreme, Franklin, Shoreham, Topsham, and Waitsfield have each lost less than one subscriber in ten.
- Cable competition appears to be a chief cause of line loss between 2008 and 2011. ILECs lost more telephone lines if they had a high proportion of their locations served by cable.[34] Since cable buildout has occurred chiefly in more densely populated areas, it is not surprising that ILECs with high location densities also lost more lines during this period.[35]

FairPoint NNE is by far Vermont's largest carrier, with 81% of all the locations in Vermont. FairPoint NNE also has:

  - A high location density (67 locations per square mile), primarily because it serves nearly all of Vermont's larger cities.
  - A high proportion (72%) of its locations wired for cable.
  - A low (56%) ratio of residential subscribers to residential locations.[36]

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[33] The correlation of exchange data between location density and the ratio of residential switched lines to residential locations is -0.35, which is weak. There is no correlation when exchange data is aggregated to the study area level.

[34] The unweighted correlation among ten study areas is 0.80.

[35] The unweighted correlation among ten study areas is 0.78.

[36] Lines can actually exceed locations in cases where there are many multiline businesses and no cable competition.

Because of its size, FairPoint NNE's study area justifies closer analysis. Table 3.4 treats the FairPoint NNE study area as three separate study areas based on previous work that divided its service area into three "UNE zones,"[37] denominated "rural," "suburban," and "urban."

UNE Zone	Ex-changes	Density (Loc. / Square Mile)	Pct. Locations with Cable	Residential Switched Lines to Residential Locations
Rural	59	40	53%	65%
Suburban	21	87	85%	51%
Urban	2	511	98%	36%

Table 3.4. Selected Ratios for FairPoint NNE UNE Zones

Table 3.4 shows the same kinds of patterns within FairPoint NNE's single large service area that Table 3.2 showed for all 10 Vermont study areas.

- Most of the exchanges are rural.
- Density in the rural zone is comparable to density in several independent company areas, such as Franklin and VTel.
- Cable competition is concentrated in the urban and suburban zones. The urban zone has been almost completely overbuilt by cable.[38]
- FairPoint NNE is least successful in serving the suburban and urban zones. This is reflected in both of the last columns. Notably, from 2008 to 2011, FairPoint lost almost two-thirds of its urban subscribers and about half its suburban subscribers.

IV. Forward-Looking Cost

A. The HCPM Forward-Looking Cost Model

Analysis of forward-looking costs can help Vermont policy makers gain a basic understanding of which geographic areas within Vermont might need universal service support. RLSA estimated the forward looking costs of providing telecommunications service using an updated version of the FCC's "High Cost Proxy Model" (HCPM), which is also sometimes

[37] These preexisting divisions were established at the time that Vermont prescribed "UNE" zones for FairPoint's predecessor. The Rural zone here includes ten exchanges served from New Hampshire. Most of these exchanges are extremely rural.

[38] We understand that FairPoint NNE's urban and suburban zones have nearly ubiquitous wireless coverage.

called the "Synthesis Model." This model was developed by the FCC in the late 1990s. Historically, this model produced cost outputs that were used until recently in the FCC's "Model-Based Support" program.[39] RLSA ran the HCPM to estimate the average forward-looking costs of Vermont's 135 exchanges.[40]

The HCPM model has some known problems, which RLSA has addressed. We made the following adjustments to inputs, network design, and outputs:

1. **E-911 Location Inputs.** The FCC's original HCPM cost results in 1999 did not rely on accurate customer locations. Instead, the FCC distributed customers evenly along known roadways in each exchange, and the model then built a virtual network to those virtual customer locations. With substantial assistance from the Public Service Department, RLSA has updated the customer locations data. The results presented here use Vermont's 911 database to identify locations.

2. **Special Access Circuit Inputs.** The HCPM model treats point-to-point or "special access" circuits as a service that is jointly provided on the common network. The more special access circuits that exist in an exchange, the more common cost that the model assigns to special access and the less common cost shows up in the end as cost assigned to switched lines. For input, the HCPM model used the "voice grade equivalent" count of special access lines in each exchange.[41] The model then estimated how many special access circuits were needed for this demand, and it estimated and allocated costs accordingly. The HCPM model recognized only small capacity circuits on copper cable, and it took no account of fiber-based transmission or large capacity circuits on copper cable.[42]

   Three things have changed. First, special access today operates at much higher circuit capacities than in 1999. This makes it more difficult to parse the number of circuits implied by the model's traditional input data.[43] Second, many special access circuits today are provided using light fibers rather than copper loops. This reduces the cost of

[39] For over a decade the Model-Based Support program provided support to Verizon in Vermont and then to FairPoint in Vermont.

[40] As explained above, Vermont has 148 wire centers and 135 exchanges. Some exchanges consist of two or more wire centers. These areas were treated as a unit during the HCPM modeling.

[41] A "T-1" circuit has 24 voice grade equivalents. A "T-3" circuit has 672.

[42] In 1999 all special access circuits were assumed to be DS-0 or DS-1 circuits. Today a DS-1 circuit is the smallest capacity of the many varieties of special access sold by carriers in any quantity.

[43] For example, for an exchange that reports 2,017 special access lines, the carrier could be providing 2,017 copper-based "DS-0" lines. Or, the carrier could be providing three "DS-3" lines and a single DS-0 line. Or, the carrier could be providing a single fiber-based "OC-3" line and one DS-0 line. These options generate vastly different costs.

special access circuits.[44] Third, special access circuits today are more plentiful than they were in 1999.[45] This makes it likely that any error regarding special access will distort the cost results. RLSA found that these three post-1999 market and technology changes made the HCPM model's special access calculations more important but less reliable, particularly in the many urbanized exchanges that report a large number of special access voice equivalent lines.

To correct for this problem, RLSA pre-processed the special access line counts that are used as model inputs.[46] The pre-processing greatly reduces the input special access line counts given to the model,[47] and the model therefore assigned less common cost to special access in those many exchanges with a large number of reported special access lines. RLSA believes that with this update to the HCPM model, the resulting cost outputs more accurately reflect the cost and design of modern telecommunications networks that employ large capacity and fiber-based services.

3. **Unit Cost Inputs.** RLSA updated HCPM's cost input tables to reflect current materials and labor unit costs.[48] This included updating:
    a. the cost of copper and fiber cables;
    b. the cost of labor;
    c. the cost of poles;
    d. the cost of switches;

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[44] Today a light fiber based special access circuit can be installed for roughly the same cost as a copper line, and can carry thousands of times the traffic.

[45] For numerous Vermont exchanges the input data reported more than four times as many special access lines as switched lines.

[46] RLSA reduced the special access line inputs by a factor that depended on size. For exchanges with 24 or fewer special access lines, we made no change because all such lines must be DS-0 or the analog equivalent.
For larger exchanges, RLSA reduced the special access line count using a ratio that depended on the number of special access lines initially reported. This caused the model to construct a number of wire pairs for special access that was a small percentage of the number of input lines. The relationship was Wire Pairs = 0.29 x (Lines ^ -0.306). As a result, for an exchange with 1,000 reported special access lines, the model constructed 35 wire pairs. For an exchange with 10,000 reported special access lines, the model constructed 174 wire pairs. For an exchange with 100,000 reported special access lines, the model constructed 859 wire pairs.

[47] The pre-processing step reduced the total Vermont special access channels in the state from 579,000 to 35,000. For comparison purposes, RLSA used a switched line count for Vermont of 243,000. The pre-processing step also reduced the special access lines in every exchange to a value lower than that of the switched lines in that exchange.

[48] In general, RLSA used the cost inputs recently suggested to the FCC by proponents of the "ABC Plan." Where the ABC inputs were structured differently from HCPM inputs, RLSA adapted the ABC inputs to the structure required by the HCPM model.

e. the construction costs associated with placing poles and conduit, trenching and repairing roads;
f. the cost of electronic equipment used in the distribution network;
g. the cost of manholes; and
h. manhole spacing standards.

4. **Design for Broadband.** The original HCPM runs from the FCC assumed a network with copper distribution loops of not more than 18,000 feet. This kind of network supports voice service and also can support DSL at the speeds that were commonly offered in the 1990s. Such long loops cannot reliably support DSL at a 4 Megabit per second download speed that the FCC is establishing as a minimum for federal support program eligibility. RLSA's HCPM runs used a maximum design loop length of 10,000 feet, which is ordinarily sufficient under modern conditions to provide 4 Megabits of download speed and 1 Megabit of upload speed.

   RLSA could have modeled the cost of only a voice-capable network, but any such result would have been discordant with the current economic realities of running a telecommunications company and with customer demands. Today, most citizens not only expect Internet availability at their residences and places of business, but they also expect broadband speeds. For that reason, broadband is an essential element in any wireline telecommunications provider's service portfolio. Voice services are declining as a profit center for operators and are being replaced by data. It has been obvious for a decade or more that a telecommunications provider who does not offer broadband cannot long survive. Since voice services can be provided with ease over a data-only broadband network, and since public policy has seen fit to promote access to broadband networks, it makes sense to use broadband network design parameters.

5. **Design for Border Exchanges.** In some rural areas, the HCPM model relies upon central offices in one exchange area to support loops in another exchange area. In ten exchanges the serving central office is across the Connecticut River in New Hampshire.[49] To produce meaningful results in these areas required manipulation of the model's input data files. With assistance from the Public Service Department, RLSA made those adjustments.[50] RLSA believes the resulting costs are a good approximation of the actual forward-looking cost in these ten exchanges.

6. **Assumed Plant Distribution and Feeder Mix and Sharing with Other Utilities.** HCPM assumed that companies in all parts of the country have equal ratios of aerial plant to buried plant. It also assumed that all companies share structure (e.g. utility poles) costs in the same ways with electric and cable companies. RLSA modified these structure ratios to reflect Vermont's installed network.

[49] Those exchanges were Bloomfield, Canaan, Guildhall, Lemington, Maidstone, Norwich, Stamford, Thetford, Wells River, and Westminster.

[50] The adjustments effectively treated these nine exchanges as served from new or existing central offices at a suitable location within Vermont.

a. RLSA modified the model's assumptions regarding Vermont companies' mix of aerial, buried, and "underground" (includes conduits) facilities. To better reflect practices in Vermont and New England, we increased the aerial mix proportion for both distribution[51] and feeder cable structure.[52]

b. RLSA also modified the model's assumptions about how costs are shared between telecommunications and other utilities.[53]

7. **Location as the Basis for Expressing Cost Outputs.** RLSA has substituted location counts for line counts in the model's inputs and outputs. Therefore the cost outputs of the model are an estimate of forward-looking *cost per location* rather than *cost per subscriber.* If Vermont adopts a high-cost support mechanism, a condition of that support is likely to be that the supported carrier must provide something like Carrier-of-Last-Resort (COLR) service throughout a designated service area. Subscriber line counts depend heavily on the extent of competition and the provider's past success in meeting customer needs. For these reasons, estimating cost per location is the more reliable statistic for universal service purposes. Cost per subscriber therefore can fluctuate greatly if a carrier has lost subscribers due to competition or poor service. To understand cost in a universal service context, forward-looking cost per location is the more valid measure.

RLSA did not attempt to address an additional problem with the HCPM model. The model lays out the virtual feeder and distribution facilities in each exchange, and it then estimates the costs of financing the construction of that network and operating it. The model uses a simplified method of designing that network.[54] Altering the model to solve this problem by ensuring that all facilities are placed along roads or other recognized rights-of-way requires software modification that would have been prohibitively expensive. In RLSA's judgment, this

[51] For distribution structure, RLSA assumed that between 56% and 64% is aerial plant. HCPM had used 10% to 40%.

[52] For feeder structure, RLSA assumed that 40% to 60% is aerial plant. HCPM had used 5% to 45%.

[53] RLSA set the percent of the structure plant assigned to telephone carriers at 48 percent for poles and between 76 and 96 percent for buried and underground plant. HCPM had set the percent of structure plant assigned to telephone carriers between 35 and 50 percent for poles and between 55 and 100 percent for buried and underground plant.

[54] HCPM designs a virtual feeder and distribution network that reaches out to customers from each wire center. The algorithm for designing that network used a concept called a "minimum spanning tree." This is a mathematical procedure to connect a series of points using the smallest possible cable lengths. The model did not design the network using actual rights of way or the existing road network. Instead, it used a rectilinear assumption, assuming that distribution cable runs will make only 90 degree turns to reach each customer. It would be possible to replace the current minimum spanning tree calculation with a new road-constrained minimum spanning tree calculation, and such a change would improve the model's accuracy, especially in the Vermont's more mountainous areas.

unresolved design issue within the HCPM model should prevent Vermont from using that model as a basis for calculating support under a new USF support mechanism.

RLSA did not give any Vermont carriers or outside parties an opportunity to examine the HCPM model or its underlying assumptions.[55] Nevertheless, even with the above limitation, RLSA concludes that the cost data reported below are sufficiently reliable to support general conclusions about the differential forward-looking costs of providing local exchange service to various exchanges throughout Vermont.

The HCPM model also produces an output that report on how much area it has covered with its virtual distribution facilities. This output, which we call "inhabited area," comprises the area of all the polygons served by the HCPM model's facilities, and.is used below in calculating densities. The inhabited area of an exchange will be considerably smaller than the total area if the exchange contains large swaths of uninhabited mountainous areas, farmland, or parks.

B. Results

Appendix A reports both total area and inhabited area data for each Vermont exchange. This section analyzes those results.

1. Results by Exchange

As one would expect, the cost in rural areas is far higher than the cost in urban areas.

Size is a good predictor of cost, and the smallest exchanges usually have the highest average cost. Density, however, is an even better predictor of cost. Chart 4B1 shows graphically the result for all 135 Vermont exchanges.

[55] RLSA understands that Vermont carriers independently performed some cost estimation work with a more modern model, but they have not submitted the results to RLSA.

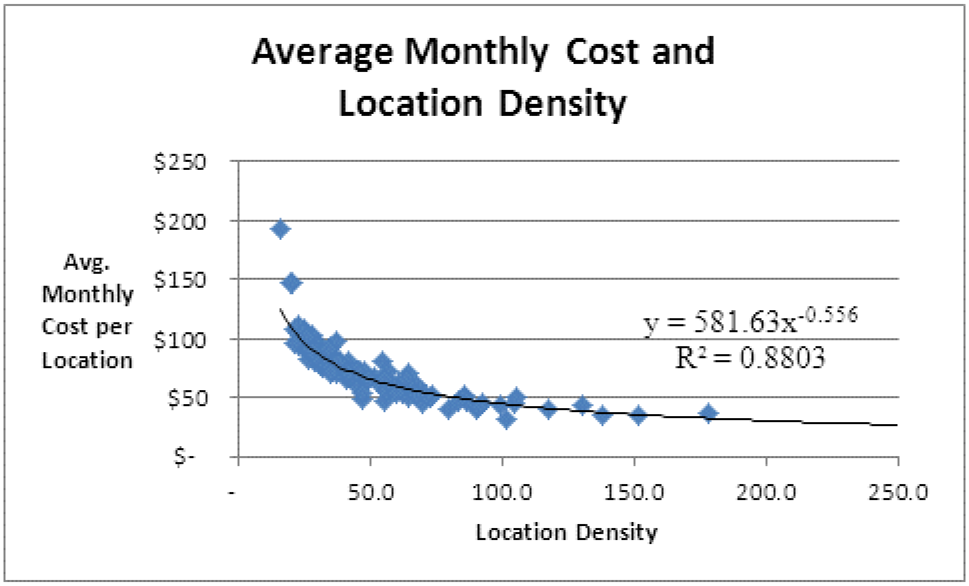

Chart 4B1. Average HCPM Cost of Service as Affected by Location Density[56]

Chart 4B1 shows several things about the relationship between average cost and location density. First, the correlation is very strong. This means that density is a reliable predictor of how the HCPM model views average forward-looking cost. Second, Vermont is in general a costly place to provide service. The majority of Vermont exchanges fall in the range of about $45 to $80. The mean cost is $58, which is almost certainly higher than the average cost in more urbanized states, which can be less than $20.[57] Third, Vermont has relatively few lower cost exchanges. Burlington anchors the list at $23.46. Fourth, the relationship approximates a hyperbola, which means that exchanges with very low density can have extraordinarily high average cost. A few Vermont exchanges actually have costs in excess of $100 per location per month.

Table 4B2 illustrates the general relationship between density and cost in selected FairPoint NNE exchanges.

Exchange	**Location Density**	**Average Cost per Location**
Burlington	544	$ 23

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[56] The chart shows an "R^2" of 0.8803. This means that 88% of the variation in forward-looking costs can be explained by location density. This is a strong correlation.

[57] The Universal Service Administrative Company reported in the first quarter of 2010 that the average forward-looking national cost was $21.43 per line per month. The average forward-looking cost in California was $17.43 and in New Jersey was $18.14. These values are not directly comparable to those presented here because the FCC's HCPM runs did not adopt the modifications described above. RLSA did not run the revised model for states other than Vermont.

Exchange	Location Density	Average Cost per Location
Rutland	152	$ 35
Bennington	118	$ 41
Milton	92	$ 46
Brattleboro	70	$ 46
Morrisville	46	$ 61
Lyndonville	42	$ 68
Barton	34	$ 78
Troy	30	$ 85
Island Pond	28	$ 98
Guildhall	20	$ 147
Lemington	16	$ 193

Table 4B2. Average Forward-Looking Cost of Service in Selected Exchanges

It is noteworthy that one state has established a high-cost fund that uses density as a single predictor for cost.[58] These results support the view that location density is a very reliable predictor of forward-looking cost in Vermont.

2. Results by Study Area

RLSA aggregated the cost results from its HCPM modeling runs at the study area level. The resulting cost estimates still vary considerably, but far less than for single exchanges. Table 4B3 displays the results, in alphabetical order. The cost data are shown again in Chart 4B4.

Study Area	Exchanges Covered	Square Miles	Location Density	Average Cost per Location
FairPoint NNE	92	4,050	59	$ 54
FairPoint Northland	8	216	34	$ 82
Franklin	1	24	39	$ 81
Ludlow	2	51	68	$ 45
Northfield	1	54	47	$ 49
Perkinsville	1	23	41	$ 78
Shoreham	6	143	29	$ 96
Topsham	1	85	23	$ 104
VTel	14	399	41	$ 73
Waitsfield	9	395	46	$ 72

[58] The Nebraska Universal Service Fund uses density as a predictor of cost. It also uses embedded cost as a check to ensure that companies cannot over-earn based on forward-looking support.

Table 4B3. Average Forward-Looking Cost of Service in Vermont Incumbent Study Areas

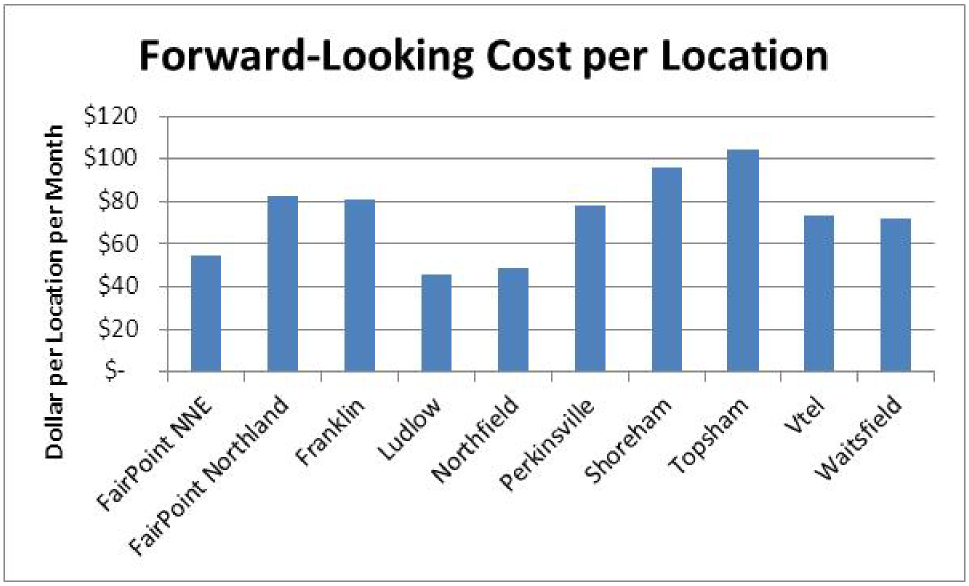

Chart 4B4. Average Forward-Looking Cost of Service in Vermont Incumbent Study Areas

This cost pattern has three groups. At the bottom ($40 to $60) are FairPoint NNE, Northfield, and Ludlow. In the middle group ($60 to $80) are Franklin, Perkinsville, VTel, and Waitsfield. In the high-cost group ($80 to $100) are Franklin, Northland (FairPoint), and Shoreham. Topsham is the most costly, at $104.

These results offer further evidence that more rural carriers have lower densities and higher costs. Topsham, which serves a very rural area, has the lowest density and the highest cost. Shoreham, Northland (FairPoint), Perkinsville, and Franklin are not far behind.

3. Results by Owner

RLSA also aggregated the cost results from its HCPM modeling runs at the owner or holding company level. This table therefore aggregates the two FairPoint study areas and the three TDS study areas. Results for the smaller companies remain the same as above. Table 4B5 displays the results, in alphabetical order.

Study Area	Exchanges Covered	Square Miles	Location Density	Average Cost per Location
FairPoint (NNE and Northland)	101	4,320	58	$ 55
Franklin	1	24	39	$ 81
OTT (Shoreham)	6	143	29	$ 96
TDS (Ludlow, Northfield, Perkinsville)	3	75	60	$ 52
Citizens (Topsham)	1	85	23	$ 104

Study Area	**Exchanges Covered**	**Square Miles**	**Location Density**	**Average Cost per Location**
VTel	14	399	41	$ 73
Waitsfield	9	395	46	$ 72

Table 4B5. Average Forward-Looking Cost of Service by Owner

Although there are only seven owners, the resulting cost estimates still vary considerably. No Vermont carrier has forward-looking costs lower than $50 per location per month. The two companies that have multiple study areas, TDS and FairPoint, also have the lowest costs. All the other Vermont ILECs have costs of at least $70 per location per month.

RLSA would note here that the case for state universal service support will depend heavily on cost, but also on some other factors that are evaluated elsewhere:

- The company's business prospects and overall profitability. These topics are discussed below in Part VII.
- Revenue from other telecommunications carriers and the federal government. This topic was discussed in RLSA Report No. I of this series, previously issued.
- Revenue from subscribers. This topic will be discussed in RLSA Report No. III of this series, not yet issued.

C. FairPoint Results by UNE Zone

FairPoint NNE serves a diverse area that includes both Vermont's larger cities and some very rural exchanges. Fortunately, FairPoint NNE's study area can be divided by a previously established standard called "UNE Zones." These zones were established some years ago for purposes of establishing prices for certain wholesale services. There are three zones: "urban," "suburban," and "rural." The cost and density of FairPoint, broken apart by UNE zones, are shown in Table 4C1 below.

Study Area	**Exchanges**	**Square Miles**	**Average Density**	**Average Cost per Location**
Rural	69	2,803	40	$ 71
Suburban	21	1,199	87	$ 44
Urban	2	48	511	$ 24

Table 4C1. Average Forward-Looking Cost of Service by Owner

Table 4C1 confirms that FairPoint serves very diverse exchanges. If FairPoint's UNE zones were separate study areas, the average cost of its rural zone would be comparable to that of some smaller Vermont carriers such as Waitsfield and VTel.

V. Embedded Cost

RLSA has also calculated the "embedded" or accounting costs of the incumbent carriers.[59] The analysis in this section is derived from data responses from the ILECs as well as publicly available data which RLSA independently evaluated. We also used other public sources to provide additional information and to cross-check the Vermont results.

This section is of potential value to legislators because it allows for consideration of how costs vary by geographic area and by ILEC study area.

A. Methods

With cooperation from RLSA, the PSD distributed data requests to Vermont ILECs. The data requests requested detailed information regarding the ILECs' recent and projected cost of service. RLSA independently assessed those responses and in a few cases made subsequent inquiries. In some cases RLSA checked the data request results against historical information previously filed with the PSD and with publicly available data, such as that available from the National Exchange Carriers Association and the Universal Service Administrative Company to inform its analysis.

RLSA **e**stimated the incumbents' current company-wide costs using a traditional rate-of-return approach. These methods are common to those used for rate cases and similar in many respects to other universal service programs. To estimate the cost of capital in this analysis, RLSA used net investment reported by the carriers and applied a cost of capital of 11.25% on net investment.[60] For operating expenses, RLSA used actual expenditures reported by the carriers, without any adjustments.

The scale of geographic data in this section was the study area. This is the only practicable option because embedded cost input data are not available at a finer scale.

For each carrier, RLSA looked separately at two scopes of operation. First, we examined the cost of traditional regulated operations. This includes costs of maintaining local feeder and distribution networks, central offices including switches, and interoffice links. It also includes telephone company general operating expenses such as customer service operations and corporate operations. This first analysis excludes toll operations. This "regulated" analysis also excludes some of the costs of providing DSL services, which are also commonly sold through an affiliate. Therefore Internet routers are excluded as are interoffice links dedicated to Internet traffic.

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[59] This section responds to the 2012 statutory directive to look at "current" costs.

[60] After consideration of income taxes, this requires a capital carrying cost of between __% and __%, depending on company size.

Second, we looked at non-regulated services that are provided over the same telecommunications networks but that have traditionally not been subject to rate regulation. This analysis considered toll and DSL operations when those are sold through affiliates. In this analysis, internal transfers were netted out in the profitability analyses.[61] The analysis of non-regulated services was hindered two ways. First, there is no uniform accounting system for non-regulated operations. Second, companies have different structural methods of providing these services. Some provide the services directly through the ILEC, others through affiliates. For those companies that sell non-regulated services directly by the ILEC, net profits were reported, but not the component expense and revenue elements. This data gap tended to understate the resulting embedded non-regulated cost estimates for these companies, but it did not affect profitability.[62]

Summing the regulated analysis and non-regulated analysis allowed RLSA to produce a combined or "all-in" analysis that treats all related telecommunications affiliates as a single entity. Therefore it managed to incorporate all related network operations, including toll and DSL.

B. Results

RLSA found that the average r embedded cost for regulated operations of Vermont's ten incumbent telephone companies is high, $81 per location per month. There is considerable variation around that average. The ten study areas range from a low of $41 per location per month to a high of $124. Chart 5B1 displays the results for the ten Vermont study areas, showing only regulated operations.

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[61] Total revenue figures and total expense figures were not always netted out and therefore are not reliable indicators of the operations of the holding company. This problem does not arise, however, for profitability analyses.

[62] The results, discussed below, show widely differing non-regulated costs among companies. This suggests that the companies used different methodologies to report their costs.

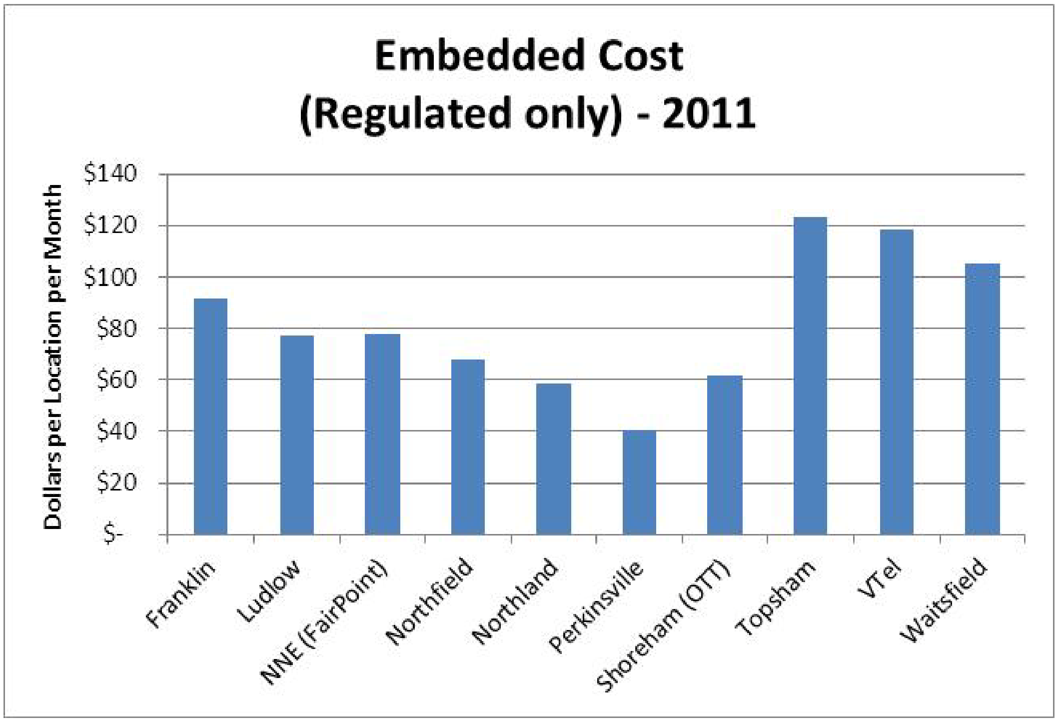

Chart 5B1. Embedded Regulated Cost for Vermont Study Areas

The chart shows that regulated total embedded cost varies from a low of $41 for Perkinsville to a high of $124 for Topsham. This is a wide variance, and it indicates that, at least for regulated operations, the companies are spending quite different amounts of money providing phone and broadband service to their customers.

Topsham had the highest embedded cost and the lowest location density of all Vermont's study areas. For other ILECs, however, the correspondence is less clear. The data are displayed in Chart 5B2.

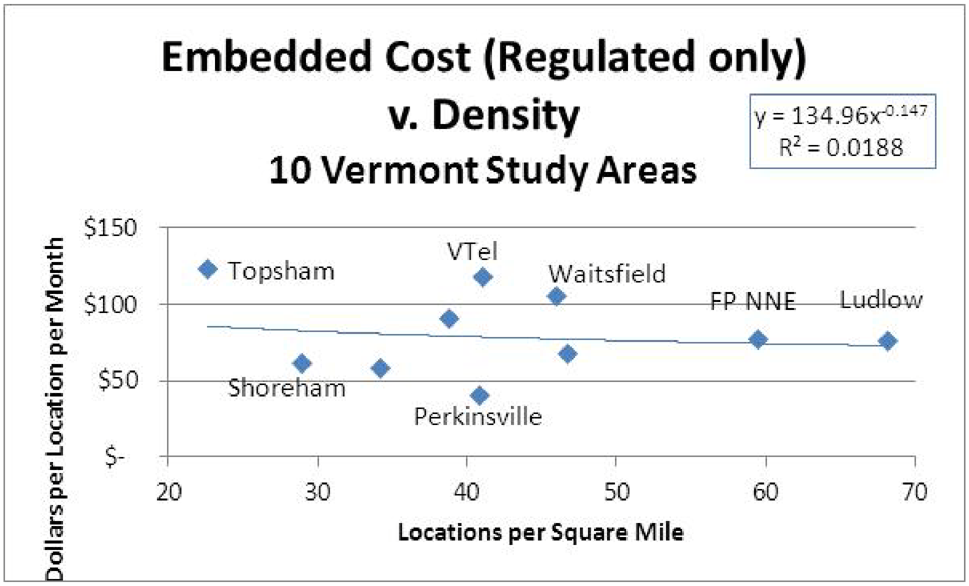

Chart 5B2. Embedded Cost v. Location Density

These results are very unlike those in Chart 4B1 above. There, the forward-looking cost of 135 exchanges was strongly correlated with location density, and the association was clearly visible by inspection. In Chart 5B2, only ten points are shown because the data are aggregated to the study area level. Topsham has the lowest density and the highest embedded cost. But the data for other carriers show no reliable association. [63] Especially in the middle density range, embedded costs can be high or low.[64]

Non-regulated operations include toll and broadband. The ILECs have made confidentiality claims that prevent RLSA from disclosing the details of non-regulated cost for individual companies. We did receive confidential information on this subject, however, and we can offer aggregated information here.

The kinds of non-regulated cost information submitted by the companies varied greatly. There are three possible reasons. First, there is no uniform system of accounts and reporting for non-regulated operations. RLSA used the results of a specialized data request that we designed to acquire this information, but the absence of an underlying uniform accounting system made us suspect that different companies prepared their submissions in different ways.[65] Second, a few companies offer these non-regulated services directly through their LEC operations, but most

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[63] The R-squared of the association is only 0.0188. This means that only 2% of the variation in embedded cost among the ten carriers can be explained by density.

[64] As explained in Part VIII below, different plant average ages could increase or decrease cost. Companies with low cost often are those which also have older plant that is highly depreciated and does not generate a substantial amount of capital cost.

[65] For the same reason we could not ensure that we had eliminated all intra-company transfers among affiliates that should net to zero.

have a variety of subsidiaries to offer these services. This created some additional data reporting differences among the companies.[66] Finally, the reported data suggests that the companies have different strategies for supporting their non-regulated operations, such as how they pay for "middle mile" Internet expenses. The companies reported wildly different amounts for their nonregulated costs, even though their services are quite similar. Based on all these considerations, we think that this report may understate non-regulated costs.

With these qualifications in mind, nonregulated operations added an average of $16 cost per location per month. Five study areas reported costs of at least $15 per month. The other five study areas reported costs under $10 per location per month.

The average "all-in" embedded cost is the sum of regulated and non-regulated. It is $97 per month per location.

VI. Cost Conclusions

Table 6A1 below summarizes per-location cost data from the two preceding sections, forward-looking cost and embedded cost.

<table>
<tr><th></th><th colspan="3">Cost per location per month</th></tr>
<tr><th></th><th colspan="2">Embedded 2011</th><th>FLEC</th></tr>
<tr><th>Company</th><th>Regulated Operations Only</th><th>All Operations (regulated and non-regulated)</th><th>HCPM Model</th></tr>
<tr><td>Franklin</td><td>$ 92</td><td rowspan="11">Confidential - Redacted</td><td>$ 81</td></tr>
<tr><td>*FairPoint</td><td>$ 77</td><td>$ 55</td></tr>
<tr><td>- Urban</td><td rowspan="4">NA</td><td>$ 24</td></tr>
<tr><td>- Suburban</td><td>$ 44</td></tr>
<tr><td>- Rural</td><td>$ 71</td></tr>
<tr><td>- Northland</td><td>$ 82</td></tr>
<tr><td>VTel</td><td>$ 119</td><td>$ 73</td></tr>
<tr><td>Waitsfield</td><td>$ 105</td><td>$ 72</td></tr>
<tr><td>TDS</td><td>$ 69</td><td>$ 52</td></tr>
<tr><td>Shoreham (OTT)</td><td>$ 62</td><td>$ 96</td></tr>
<tr><td>Topsham</td><td>$ 124</td><td>$ 104</td></tr>
<tr><td>State Average</td><td>$ 81</td><td>$ 97</td><td>$ 58</td></tr>
</table>

Table 6A1. FLEC and Embedded Cost in Vermont Incumbent Study Areas

[66] As explained above, RLSA's data collection assumed that Vermont carriers would offer toll and broadband services through separate affiliates. Accordingly we did not separately collect expense and revenue data for these operations. Instead, consistent with the Department of Public Service annual report format, we collected only net profit data, not costs, regarding non-regulated operations of the ILECs.

These data confirm two obvious facts about providing wireline telecommunications service in Vermont. First, because Vermont is so rural, telecommunications service is costly.

- The Vermont average forward-looking cost is $58 per location per month. This contrasts with average costs of approximately $20 to $30 in states with more urbanized populations.
- The Vermont average all-in embedded cost is $97 per location per month. This is extraordinarily high average state cost. It is also substantially higher than the forward-looking cost.

There is substantial variation among the companies. Chart 6A2 shows the forward-looking costs of the seven Vermont owners, with the FairPoint and TDS study areas aggregated by owner or holding company.[67] It also shows embedded costs.[68]

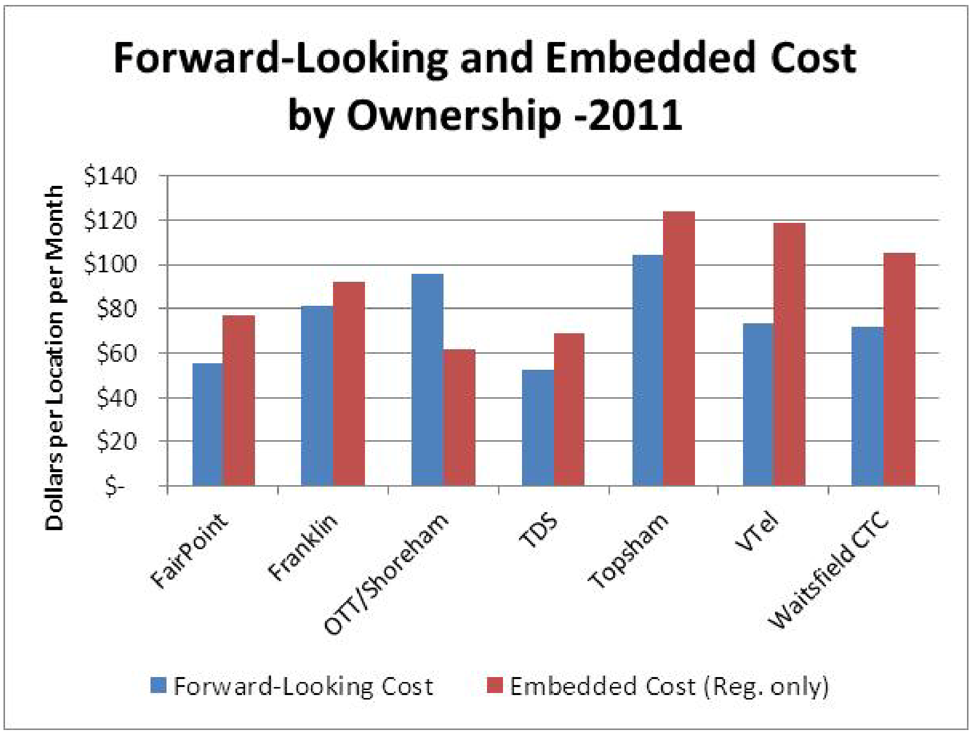

Chart 6A2. FLEC and Embedded Cost among Vermont Incumbent Owners

[67] When viewing embedded cost data, aggregating companies by ownership can eliminate the effect of cost allocations within groups of related companies.

[68] Confidentiality claims by the companies require the exclusion of embedded costs of non-regulated operations

Chart 6A2 shows that no ILEC has average forward-looking costs lower than $50 per location per month. This confirms that all seven have high cost when viewed on the scale of large national companies that serve urban states.

Chart 6A2 also shows that no ILEC has average embedded costs lower than $52 per location per month. The Chart also shows substantial variation among the seven owners.

- The two owners that have multiple study areas, TDS and FairPoint, have the lowest forward-looking costs. All the other Vermont ILECs have costs of at least $70 per location per month. Topsham's cost is the highest, more than $100.

- FairPoint's regulated embedded cost is $77 per location per month. Three Vermont carriers have regulated embedded costs higher than $100. Topsham's cost is the highest, at $124.

Referring back to Table 6A1, the HCPM column shows sub-area FLEC data for FairPoint NNE in which the company is further divided into three UNE Zones. The FLEC in FairPoint's urban zone is lower than any independent company, which makes sense because the FairPoint NNE's urban zone is essentially Burlington and Winooski, the most urbanized area in the state. In contrast, FairPoint's FLEC in its rural zone is high, $71, which is comparable to VTel and Waitsfield. In other words, FairPoint NNE is a diverse company with a few low-cost exchanges and many high-cost exchanges.

Chart 6A2 also shows sizeable differences between forward-looking cost and embedded cost for single companies. It would be surprising if there were no difference at all, if only because of inaccuracies within the HCPM model. Yet the size of the actual difference is somewhat surprising, and the direction of the typical difference is even more surprising.

OTT/Shoreham is unique in reporting an embedded cost that is lower than its forward-looking cost. Embedded cost can be lower if:

- The network provides no broadband or at a level below the standard assumed by the HCPM model. This would reduce both embedded capital and operating cost. We understand, however, that this explanation does not apply to Shoreham's services.

- The company has highly depreciated plant. This explanation is also inapplicable to Shoreham.[69]

- The company is highly efficient and has low capital cost, operating cost, or both. Given Shoreham's long history of family ownership, an extraordinarily efficient operation is a plausible.[70]

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[69] As shown below in Chart 8A1, Shoreham does not have highly depreciated plant. Its percentage of undepreciated plant is 29%, as compared to the state average of 9%.

All six of the other Vermont ILECs show embedded costs higher than forward-looking cost. In some cases the differences are sizeable. Embedded cost can be higher if:

- The ILEC is inefficient, either by investing too much in plant, by having high operating cost, or both; or.
- The model's FLEC estimate is too low because:
    - The model has a systematic bias that fails to recognize certain kinds of costs or the true magnitude of costs. For example, the model might understate national average expenses or it might assume that costs can be shared more with electric and other utilities than is in fact true.
    - The model relies on more efficient technologies than carriers actually use. For example, the model may assume the use of fiber cable and soft-switches in some locations where the actual network uses cable and older circuit switches.
    - The model incorrectly assumes that carriers have too much purchasing power when buying equipment and materials.[71]
    - The model fails to consider local features that increase capital costs such as rivers, mountains, and interstate highways.[72]
    - The model fails to perceive extraordinary local conditions that increase operating costs, such as unusually high costs for wholesale toll, "middle mile"[73] or "ISP" services.[74]

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[70] Another factor may be that Shoreham historically has been an "average schedule" company for federal ratemaking purposes. These companies have strong financial incentives to be efficient.

[71] For example, the FCC noted in 1999 that comments had indicated that Bell Atlantic's material costs for aerial copper cable were approximately 15.2 percent less that these used by Rural Utility Service companies, which in general are much smaller. *Federal-State Joint Board on Universal Service*, Tenth Report and Order, released November 2, 1999, FCC 99-304, ¶ 146.

[72] Some state officials have hypothesized that the HCPM model is biased against areas with mountainous terrain. Although that bias has never been systematically evaluated, the hypothesis is consistent with national results which show, for example, that Mississippi has the highest average cost of all the states. These Vermont data support the bias hypothesis. OTT/Shoreham is the only ILEC with embedded costs below FLEC. Shoreham's service area largely consists of relatively flat farming country in Addison County. For the other ILECs, a large share of the company service area consists of hillier terrain.

[73] "Middle mile" costs are incurred by ILECs to transport their Internet packet traffic to a regional Internet hub.

[74] "ISP costs" are payments made to other companies that provide an ILEC the right to deliver and receive packets from the Internet.

Chart 6A2 suggests but does not prove that some Vermont ILECs may be operating inefficiently. While the differences between forward-looking and embedded costs are substantial, those differences could be explained by the other model-related factors listed above. Further information and detailed analysis would be needed before any conclusion regarding inefficiency is possible.

The consistent difference between embedded and forward-looking results has implications for any future high-cost mechanism. Other states and the federal government have employed FLEC models to reduce the incentive for supported carriers to maintain wasteful spending. These models have been controversial because of their perceived inadequacies. Nevertheless, the consistently higher embedded cost in Vermont suggests that neither forward-looking cost nor embedded cost, by itself, can provide a sufficiently reliable basis for calculating support payments. Each type of data, if used in isolation, would be likely to create characteristic kinds of errors or inappropriate incentives.[75] Therefore if Vermont adopts a support mechanism for high-cost areas, the support mechanism should consider both (1) embedded cost and (2) either forward-looking cost or a density-based proxy that is derived from a forward-looking cost study.[76]

VII. Profitability

A. 2011

RLSA collected operating data for 2010 and 2011 on both the regulated and the non-regulated operations of Vermont's 10 incumbent carriers. We analyzed that data and aggregated the results to the seven owners. Net profit (or loss) is determined by the balance between revenue and expenditures. New capital investment is not counted as a current expense. Recurring operating expenditures are counted, as are interest, taxes and depreciation expenses.

Net profit is the most important single indicator of a company's long-term financial prospects. Even though profitability is affected by non-cash events such as depreciation, over the long run, positive profits are needed for a company to attract and maintain a sufficient level of capital investment to continue providing service today and to provide advanced services in the future.

Table 7A1 summarizes key financial data of the seven owner companies for 2011.

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[75] This topic is discussed further in the forthcoming Volume III of this report.

[76] Nebraska operates a state universal service fund of this type. In Nebraska, an initial support amount is calculated by exchange as a function of exchange density. The initial amount is then adjusted based on an embedded cost factor.

		Dollars per location per month					
		Net Profit(Loss) 2011			EBITDA 2011		
Owner	Total locations	Regu-lated	Non-Reg	Reg and Non-Reg	Regu-lated	Non-Reg	Reg and Non-Reg
FairPoint	248,305	$ (13)	Redacted - Confidential		$ 8	Redacted - Confidential	
Franklin	936	$ 9			$ 33		
OTT (Shoreham)	4,132	$ 2			$ 15		
TDS	6,971	$ (6)			$ 11		
Citizens (Topsham)	1,919	$ 9			$ 47		
VTel	16,363	$ (2)			$ 25		
Waitsfield	18,180	$ 3			$ 26		
State Average		$ (11)	$ (2)	$ (13)	$ 11	$ (3)	$ 8

Table 7A1. Net Profit and EBITDA in 2011 by Owner

For Vermont as a whole, regulated operations produced a net operating loss of $39 million in 2011. This amounted to $11 per location per month. Four companies earned profits. Three companies, (FairPoint, TDS, and VTel) suffered losses. The three companies with losses serve 92% of the locations in Vermont.

The ILECs asserted confidentiality claims as to their non-regulated operations. Therefore RLSA cannot report individual company results for non-regulated operations or for combined "all-in" operations. We do, however, report state-aggregated data here for non-regulated and all-in operations.

Overall, Vermont ILECs reportedly lost $6.6 million on their non-regulated operations in 2011, or $2 per location per month.[77] The companies varied considerably in the profitability of their non-regulated operations. Three companies had losses, and four had profits. The greatest loss was $4 per location per month. One company earned over $10 per location per month, and another earned $6 per location per month.

On a combined or "all-in" basis, the state average operating loss in 2011 was $45.5 million, or $13 per location per month. Three companies had losses, and four had profits. One company lost more than $15 per location per month. The other two lost less than $5 per location per month. At the other extreme, one company's profit exceeded $15 per location per month, and another company earned a profit of more than $10 per location per month.

The details of non-regulated and "all-in" operations are confidential and cannot be discussed in detail here. Nevertheless, the state totals offer some useful insights in designing a Vermont USF mechanism. First, most locations in Vermont are operated by companies that are losing money, both on their regulated operations and on a combined "all-in" basis. Second, non-

[77] The actual losses may be slightly greater because, as explained above, non-regulated cost of some companies may have been understated.

regulated operations make some financial difference, but actual experience is mixed. Non-regulated operations appear about as likely to produce a loss as a profit. Moreover, most companies have either a profit or loss that is at most a few dollars per location per month.

"EBITDA" is another way to look at a company's financial health. It means "Earnings Before Interest, Taxes, Depreciation and Amortization." Like earnings (profit/loss), EBITDA does not consider new capital investment to be a current expense. Unlike earnings, EBITDA is not affected by depreciation expense, interest expense, or tax expense. EBITDA therefore can be positive at a time when a company has negative earnings due to depreciation expense or high interest expense. EBITDA is a favored method by which banks evaluate a debtor's ability to pay interest on loans. In a universal service context EBITDA has more limited value, but it does suggest whether a supported company is sufficiently solvent to negotiate new debt and thus to continue operating. If a company has negative EBITDA, it may become unable to pay interest on existing or essential new debt. Low EBITDA can also precipitate a financial crisis because banks often lend money to utilities on the condition that they maintain certain ratios based on EBITDA. If EBITDA slips, a bank creditor can sometimes declare the borrower's debt obligations in default.

Table 7A1 shows that for regulated services, all Vermont owners had positive EBITDA in 2011 ranging from $8 to $47 per location per month. Non-regulated operations reduced the state average EBITDA by $3 per location per month, with the effect varying by company. Two companies had negative EBITDA for their non-regulated operations.

The "all-in" EBITDA effect for the state as a whole was positive $28 million, or plus $8 per location per month. All owners had positive EBITDA for their all-in combined operations.

B. 2013

In Volume I of this report, RLSA estimated revenues for the Vermont ILECs in 2013. We applied these estimates to project profitability and EBITDA for 2013. Table 7B1 summarizes estimated key financial data for the seven owners in 2013.

		Dollars per location per month					
		Net Profit(Loss) 2013			EBITDA 2013		
Owner	Total locations	Regu-lated	Non-Reg	Reg and Non-Reg	Regu-lated	Non-Reg	Reg and Non-Reg
FairPoint	248,305	$ (20)	Redacted - Confidential		$ 1	Redacted - Confidential	
Franklin	936	$ (1)			$ 16		
OTT (Shoreham)	4,132	$ (1)			$ 11		
TDS	6,971	$ (14)			$ 4		
Citizens (Topsham)	1,919	$ (6)			$ 27		
VTel	16,363	$ (18)			$ 9		
Waitsfield	18,180	$ 2			$ 23		
State Average		$ (18)	$ (2)	$ (20)	$ 3	$ (3)	$ 0

Table 7B1. Predicted Net Profit and EBITDA in 2013 by Owner

Table 7B1 shows that all Vermont owners except Waitsfield are predicted to experience losses on regulated operations in 2013. In aggregate, the predicted losses are $64 million, or $18 per location per line.

RLSA does not have sufficient information to predict any changes in either direction for non-regulated operations in 2013. We therefore assumed that non-regulated operations will lose $6.6 million, the same amount as reported for 2011.

With this assumption, the "all-in" aggregate financial operations of Vermont carriers in 2013 are predicted to produce an operating loss of $70 million. Only two owners are predicted to make a profit in 2013. One company is predicted to have a profit of $16 per location per month. The other is predicted to have a profit of only $1 per location per month. The remaining five owners are predicted to lose money, and one of those companies is expected to lose $24 per location per month.

As was true for 2011, EBITDA for 2013 is predicted to be more favorable than earnings. In 2013, RLSA predicts an aggregate EBITDA of less than $1 million on an all-in basis. When rounded to the nearest dollar, RLSA predicts an average EBITDA in 2013 of $0 per location per month.

VIII. Capital Expenditures

Capital investments are not treated as ordinary current expenses. Instead, spending on long-term investment is "capitalized," meaning that it is treated as the conversion of a cash asset into a depreciating long-term asset. Thereafter, depreciation expense is recognized and the net value of the asset decreases as depreciation accrues to offset the initial investment. In other words, capital spending is not shown directly on financial statements. Yet capital spending is an important indicator of a utility's long-term health. If a company does not keep up with its capital spending, its plant ages and it can lose the ability to provide reliable service that meet current demands.

A. Accumulated Depreciation and Net Plant

Capital cost consists of depreciation expense and a return on net investment. Net investment in turn is equal to gross investment minus accumulated depreciation. If a company has low net investment value, the cause is generally that the company neglected plant upgrades over the years. Net investment is therefore can be a good indicator of an ILEC's ability and past willingness to spend capital to update its network.

A company might have a small net investment for two reasons. First, it may never have put very much into the company originally. Second, no matter what the company invested initially, the plant may be old. Utility assets are long-lived, but a telephone pole that was installed in 1983 is likely fully depreciated today. This means that the company has had an opportunity to fully recover its investment in that pole through depreciation expense and that the pole contributes nothing to net investment.

We consider the plant age factor first. Chart 8A1 shows the percentage of undepreciated regulated plant for Vermont's 10 study areas.[78]

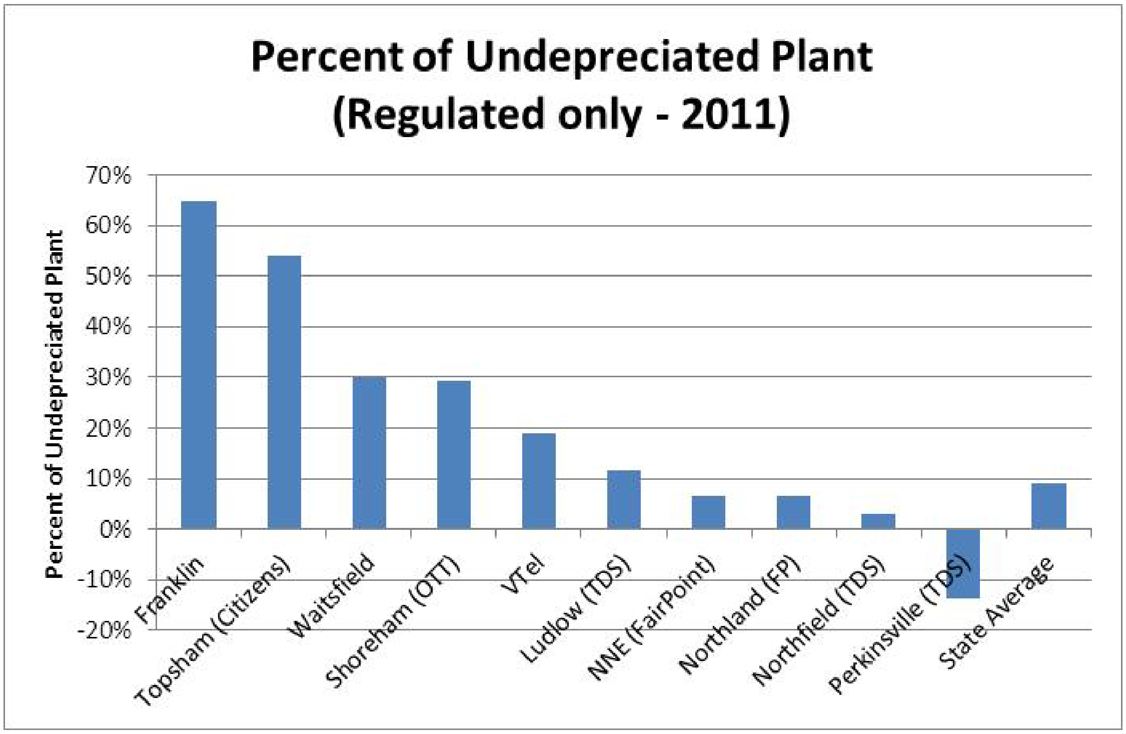

Chart 8A1. Percentage of Undepreciated Plant

Chart 8A1 shows that both Topsham and Franklin are nearly tied in the first tier. Both companies are carrying more than half of their gross plant as undepreciated assets. Both in fact have made substantial recent capital investments. Shoreham and Waitsfield are at the next tier, with about 30% of their original investment remaining on the books. VTel gets an honorable mention at 20%. The two FairPoint companies and the three TDS companies have plant that is substantially more depreciated.[79] This suggests that the FairPoint and TDS companies have not recently made substantial investments in upgrading their networks.

As explained above, cost per location closely follows density. Therefore lower density companies, all else equal, will show greater gross and net plant investment. Chart 8A2 shows actual net investment in Vermont, expressed in dollars per location, and considering only regulated assets.

[78] This percentage is equal to one minus the ratio of accumulated depreciation to gross plant.

[79] Perkinsville has a negative net investment because it has accrued larger than expected costs in removing retired plant.

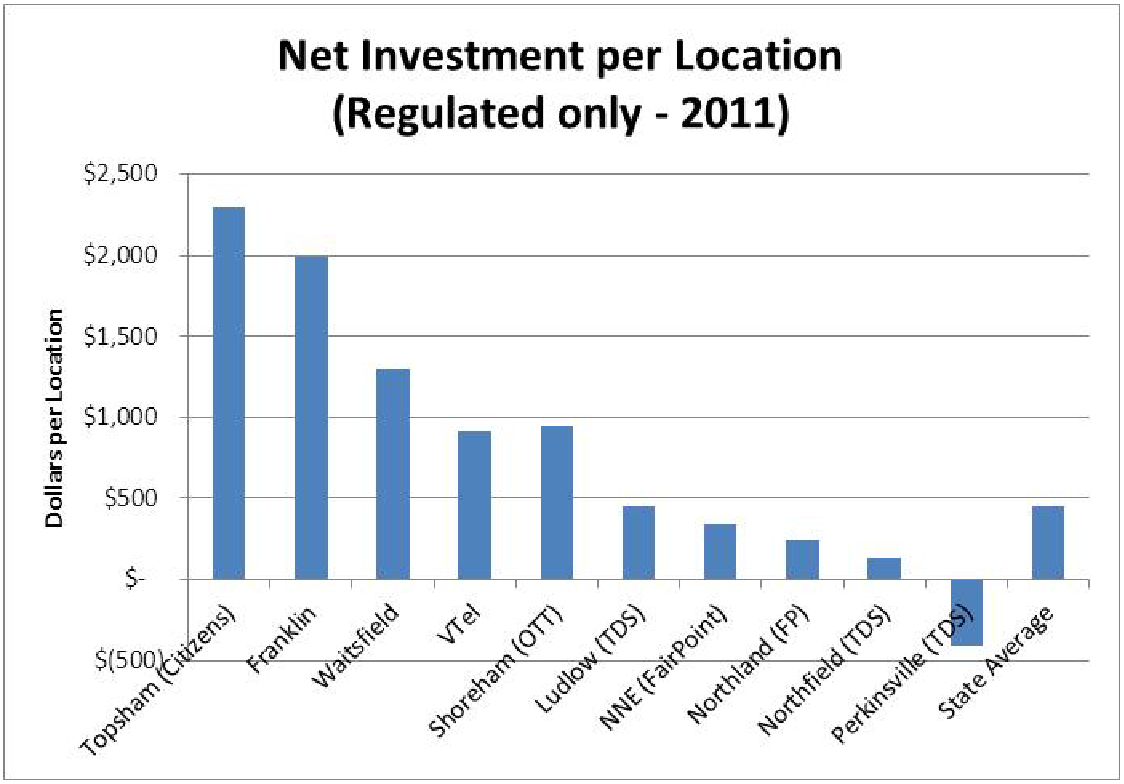

Chart 8A2. Net Investment per Location

The chart shows that, once again, Topsham and Franklin are in the first tier, with a net investment of about $2,000 per location. Waitsfield finished third at $1,300. The five study areas operated by FairPoint or TDS all have investment per location values that are below the state average of $474.

Net investment explains a substantial portion of the cost differences among the Vermont ILECs. On average, capital contributes only $4.26 to the state's average embedded cost of $81 per location per month. We saw above that Topsham has high net investment and low depreciation. For Topsham, capital cost is $34 per location per month, which comprises a substantial portion of Topsham's embedded regulated cost of $124 per location per month.

B. Capital Spending Rates

Current financial data can offer a more short-term view of an ILEC's capital spending. This short-term view can be important because companies can suddenly change course, especially in response to major regulatory changes, such as the recent FCC policy changes in its *Transformation Order*. Table 8B1 shows how capital spending for the seven Vermont owners compared in 2011 to their depreciation expense. Only regulated operations are shown.

	2011		
Owner	**Dep Exp**	**Capex**	**Ratio**
FairPoint	$ 67,774,223	$ 65,427,840	97%
Franklin	$ 175,796	$ 187,108	106%
OTT (Shoreham)	$ 564,041	$ 849,805	151%
TDS	$ 1,434,026	$ 1,019,093	71%
Citizens (Topsham)	$ 417,686	$ 136,366	33%
VTel	$ 5,148,450	$ 6,268,666	122%
Waitsfield	$ 3,670,686	$ 5,334,691	145%

Table 8B1. Ratio of Capital Expenditure to Depreciation Expense for 2011.

Table 8B1 shows that several Vermont ILECs invested more in their networks in 2011 than they claimed in depreciation expense. These were Franklin, OTT(Shoreham), VTel and Waitsfield. FairPoint was nearly at the break-even level. TDS and Citizens (Topsham) invested substantially less than their depreciation expense. If this pattern persists, TDS and Citizens will have lower net plant in future years.

This spending pattern may have changed during the last two years. Nationally, many smaller ILECs have dramatically reduced their capital expenditures following issuance of the FCC's *Transformation Order.* Our overall assessment of the Vermont data through 2011 was mildly encouraging, however. At that time, four companies were obviously continuing to invest. Topsham had less than replacement capex, but it has a very high level of net investment due to recent major investments. Even FairPoint managed to roughly maintain its net plant level, despite its failure to develop a profit. TDS appears to be the most potentially troubling case, because its net plant is low and its level of current investment was below replacement levels.

IX. Conclusions

In this second volume of its three-volume report to Vermont, RLSA responds to the direction in Vermont statute to examine "the costs and other factors affecting the delivery of local exchange service by the incumbent local exchange carriers." We also evaluated profitability. We found:

- Taken as a whole, Vermont is a daunting place to provide carrier-of-last-resort telecommunications service.
  - Average embedded cost for all regulated and non-regulated operations is $97 per location per month. For regulated operations only, average embedded cost is $81 per location per month.
  - Average forward-looking cost is $58 per location per month.
- Even though there is substantial variation among the seven ownership entities, all seven have high cost when viewed on a national scale. This is true both whether

one examines forward-looking cost and when one examines embedded costs. Among the seven ownership groups:

- As to forward-looking cost:
  - The two owners that have multiple study areas, TDS and FairPoint, also have the lowest costs, but each has costs of at least $52 per location per month.
  - All the other Vermont ILECs have costs of at least $70.
  - Topsham's forward-looking cost exceeds $100.
- As to embedded cost for regulated operations:
  - The lowest cost company is Shoreham at $62 per location per month.
  - Four Vermont groups have embedded costs higher than $100.
  - FairPoint's embedded cost is $77.
  - The highest cost company is Topsham at $124.

- Most companies have higher embedded cost than forward-looking cost. This is surprising given the advanced age of the installed facilities in Vermont. One possible reason for this difference is inefficiency. Other possible reasons include inaccurate assumptions in the estimation of forward-looking cost. If Vermont ultimately adopts a cost-based support mechanism, it should include some kind of forward-looking cost element.
- In 2011:
  - For regulated operations, all Vermont companies reported an aggregate net operating loss of $39 million. This amounted to $11 per location per month. Three companies that serve 92% of the locations in Vermont (FairPoint, TDS, and VTel) experienced financial losses.
  - Non-regulated operations produced losses of another $6 million, or $2 per location per month. Three companies lost money, and four made small profits on non-regulated operations. One company earned more than $10 per location per month, and its next closest competitor earned $6 per location per month.
  - On an "all in" basis, the Vermont companies combined lost $45.5 million, or $13 per location per month. Three companies had losses, with one

company losing more than $10 per location per month. Four companies had profits, and two earned more than $10 per month.

- In 2013, RLSA predicts:
    - For regulated operations, all Vermont owners except Waitsfield will experience losses. In aggregate, the statewide predicted losses are $64 million, or $18 per location per line. The causes of this worsening situation were more fully described in Volume I of this report.
    - On an "all in" basis, Vermont owners will have an aggregate operating loss of $70 million. Only two owners are predicted to make a profit in 2013. One of those is predicted to have a profit of $16 per location per month, and the other only $1 per location per month. The remaining five owners are predicted to lose money, and one of those is predicted to lose $24 per location per month.
    - RLSA predicts an aggregate statewide EBITDA of less than $1 million on an "all-in" basis. This amounts, when rounded, to $0 per location per month.
- In the aggregate, Vermont ILECs' telephone plant is more than 90% depreciated. This indicates that the average company has not been investing heavily in recent years.
- Vermont ILECs vary considerably in the age of their installed facilities and, accordingly, in their depreciation and capital expenditure statistics.
    - Franklin and Topsham have low accumulated depreciation and high net investment per location. This suggests substantial recent investments as well as challenging service areas.
    - The two FairPoint and three TDS companies have highly depreciated plant assets and low net investment per location. This suggests that these companies have not recently made substantial investments in upgrading their networks.
    - In 2011, several Vermont ILECs invested more in their networks than they claimed in depreciation expense. These were Franklin, OTT(Shoreham), VTel and Waitsfield. FairPoint was nearly at the break-even level. TDS and Citizens (Topsham) invested substantially less than their depreciation expense.

In the third and final volume of this report, RLSA will consider a range of economic and policy issues surrounding universal service, including price elasticity, economic development, the effects of competition. We will also offer policy options for Vermont, and one or more recommended support mechanisms.

Appendix A – Selected Exchange Data

Exchange	Telephone Company	CLLI Code	Locat-ions	Total Exch'g Area	Inhab-ited Area	Monthly Cost per Location
Addison	Waitsfield & CV	ADSNVTXA	829	51	24	$ 93
Alburg	FairPoint Northland	ALBGVTXA	1,768	49	26	$ 60
Arlington	FairPoint NNE	ARTNVTSC	2,180	131	42	$ 67
Barnet	FairPoint NNE	BARNVTCH	853	41	27	$ 77
Barre	FairPoint NNE	BARRVTEL	7,923	105	80	$ 45
Barton	FairPoint NNE	BARTVTEL	2,257	112	67	$ 78
Bethel	FairPoint NNE	BETHVTMA	2,013	115	69	$ 84
Bennington	FairPoint NNE	BGTNVTPL	8,282	186	70	$ 41
Bellows Falls	FairPoint NNE	BLFLVTHE	1,898	25	21	$ 40
Benson	Shoreham	BNSNVTXA	570	45	25	$ 110
Brattleboro	FairPoint NNE	BRBOVTMA	7,748	142	111	$ 46
Brookfield	FairPoint NNE	BRFDVTBC	572	36	27	$ 109
Bradford	FairPoint NNE	BRFRVTPG	1,146	29	21	$ 60
Brandon	FairPoint NNE	BRNDVTCA	2,711	93	45	$ 57
Bridport	Waitsfield & CV	BRPTVTXA	692	46	27	$ 100
Bristol	Waitsfield & CV	BRSTVTXA	3,970	168	98	$ 73
Bridgewater	VTel	BRWRVTXA	1,183	90	40	$ 92
Burlington	FairPoint NNE	BURLVTMA	21,447	73	39	$ 23
Cabot	FairPoint Northland	CABTVTXA	1,156	53	40	$ 86
Chester	VTel	CHESVTXA	2,579	114	74	$ 78
Chelsea	FairPoint NNE	CHLSVTMA	1,207	75	53	$ 94
Charlotte	Waitsfield & CV	CHRLVTXA	2,284	63	49	$ 72
Lemington	FairPoint NNE	CLBKNHMA	137	42	9	$ 193
Concord	FairPoint NNE	CNCRVTMA	995	93	30	$ 80
Cornwall	Shoreham	CRNWVTXA	525	29	17	$ 97
Castleton	FairPoint NNE	CSTNVTSO	1,231	31	17	$ 52
Cuttingsville	VTel	CTVLVTXA	446	37	18	$ 101
Danville	FairPoint NNE	DAVLVTYA	876	33	24	$ 73
Danby	VTel	DNBYVTXA	757	72	18	$ 74
Derby	FairPoint NNE	DRBYVTMA	1,667	33	29	$ 55
Dorset	FairPoint NNE	DRSTVTYA	768	24	12	$ 70
East Corinth	Topsham Telephone	ECRNVTXA	1,919	116	85	$ 104
E. Fairfield	FairPoint NNE	EFFDVTMA	910	66	39	$ 98
Enosburg Falls	FairPoint NNE	ENFLVTMA	2,750	145	95	$ 81
Essex Jct.	FairPoint NNE	ESJTVTLI	13,127	112	95	$ 36

Exchange	Telephone Company	CLLI Code	Locat-ions	Total Exch'g Area	Inhab-ited Area	Monthly Cost per Location
Fairlee	FairPoint NNE	FARLVTML	1,604	71	42	$ 76
Franklin	Franklin Telephone	FKLNVTXA	936	38	24	$ 81
Fairfax	FairPoint NNE	FRFXVTMA	2,018	70	49	$ 65
Fair Haven	FairPoint NNE	FRHNVTMA	1,873	53	29	$ 51
Grand Isle	FairPoint NNE	GDISVTYA	3,364	135	53	$ 59
Grafton	VTel	GFTNVTXA	351	27	13	$ 93
Greensboro	FairPoint NNE	GNBOVTGB	1,895	119	76	$ 92
Groton	FairPoint Northland	GRTNVTXA	1,357	108	49	$ 94
Maidstone	FairPoint NNE	GVTNNHST	319	31	9	$ 98
Hubbarton	Shoreham	HBTNVTXA	1,280	50	28	$ 73
Hinesburg	Waitsfield & CV	HNBGVTXA	2,157	44	36	$ 63
Norwich	FairPoint NNE	HNVRNHSC	1,533	45	37	$ 70
Hartland	VTel	HRLDVTXA	1,132	33	29	$ 75
Hardwick	FairPoint NNE	HRWKVTPK	1,891	73	44	$ 68
Isle La Motte	FairPoint Northland	ISMTVTXA	502	18	8	$ 67
Island Pond	FairPoint NNE	ISPNVTAL	1,988	290	71	$ 98
Jamaica	FairPoint NNE	JAMCVTMA	1,219	63	35	$ 81
Jacksonville	FairPoint NNE	JCVLVTSC	1,449	74	53	$ 89
Jeffersonville	FairPoint NNE	JFVLVTVA	2,238	120	54	$ 70
Johnson	FairPoint NNE	JHSNVTRA	2,189	114	52	$ 68
Ludlow	Ludlow TDS	LDLWVTXA	2,729	48	34	$ 41
Lunenburg	FairPoint NNE	LNBGVTEC	760	43	24	$ 78
Guildhall	FairPoint NNE	LNCSNHHI	367	96	18	$ 147
Thetford	FairPoint NNE	LYMENHYA	928	33	26	$ 83
Lyndonville	FairPoint NNE	LYVLVTCE	3,665	122	88	$ 68
Middlebury	FairPoint NNE	MDLBVTCC	3,430	102	47	$ 50
Middletown Spr.	VTel	MDSPVTXA	797	57	32	$ 99
Milton	FairPoint NNE	MLTNVTEL	4,711	79	51	$ 46
Manchester	FairPoint NNE	MNCHVTSC	3,664	70	35	$ 46
Marshfield	FairPoint Northland	MRFDVTXA	666	42	25	$ 93
Morgan	FairPoint NNE	MRGNVTTO	1,510	83	54	$ 87
Morrisville	FairPoint NNE	MRVLVTUN	4,693	150	101	$ 61
Montgomery	FairPoint Northland	MTGMVTXA	868	70	27	$ 88
Mount Holly	VTel	MTHLVTXA	1,268	68	36	$ 84
Montpelier	FairPoint NNE	MTPLVTSC	6,602	181	118	$ 48
Stamford	FairPoint NNE	NADMMASU	455	41	13	$ 87
Northfield	Northfield TDS	NRFDVTXA	2,524	93	54	$ 49

Exchange	Telephone Company	CLLI Code	Locat-ions	Total Exch'g Area	Inhab-ited Area	Monthly Cost per Location
N. Springfield	VTel	NSFDVTXA	878	10	8	$ 50
Bloomfield	FairPoint NNE	NSFRNHMA	253	65	13	$ 146
Newbury	FairPoint NNE	NWBYVTPC	321	14	8	$ 80
Newfane	FairPoint NNE	NWFNVTYA	2,353	100	63	$ 75
Newport	FairPoint NNE	NWPTVTSE	3,694	85	59	$ 54
Orleans	FairPoint NNE	ORLNVTIR	2,349	128	83	$ 91
Orwell	Shoreham	ORWLVTXA	746	47	29	$ 104
Peacham	FairPoint Northland	PCHMVTXA	464	34	19	$ 109
Perkinsville	Perkinsville TDS	PKVLVTXA	947	33	23	$ 78
Plainfield	FairPoint NNE	PLFDVTYA	1,659	63	50	$ 77
Poultney	FairPoint NNE	PLTNVTBE	2,714	66	48	$ 55
Panton	Waitsfield & CV	PNTNVTXA	634	37	15	$ 81
Proctor	FairPoint NNE	PRCTVTPI	761	7	4	$ 37
Proctorsville	Ludlow TDS	PRVLVTXA	771	29	17	$ 61
Pittsfield	FairPoint NNE	PTFDVTMA	610	30	13	$ 73
Pittsford	FairPoint NNE	PTFRVTYA	1,803	106	37	$ 65
Putney	FairPoint NNE	PTNYVTCH	1,669	48	39	$ 68
Pawlet	VTel	PWLTVTXA	807	53	29	$ 93
Pownal	FairPoint NNE	PWNLVTBE	1,342	35	20	$ 57
Richford	FairPoint NNE	RCFRVTIN	1,148	57	27	$ 72
Richmond	Waitsfield & CV	RCMDVTXA	3,315	126	60	$ 67
Readsboro	FairPoint NNE	RDBOVTTU	468	38	14	$ 92
Reading	FairPoint NNE	RDNGVTMI	1,293	68	43	$ 85
Randolph	FairPoint NNE	RNDHVTPL	2,857	110	77	$ 70
Rochester	FairPoint NNE	ROCHVTSP	1,324	139	50	$ 84
Rupert	FairPoint NNE	RPRTVTGR	381	35	14	$ 103
Rutland	FairPoint NNE	RTLDVTWE	9,820	106	65	$ 35
Sherburne	VTel	SHBNVTXA	1,175	46	17	$ 61
Shoreham	Shoreham	SHHMVTXA	660	45	29	$ 112
Shelburne	FairPoint NNE	SHLBVTPH	3,040	44	23	$ 44
Salisbury	FairPoint NNE	SLBRVTBA	740	27	16	$ 68
S. Londonderry	FairPoint NNE	SLNDVTYA	2,756	122	65	$ 70
Springfield	VTel	SPFDVTXA	2,952	43	35	$ 52
Stratton	FairPoint NNE	SRTNVTAR	2,116	62	25	$ 51
S. Royalton	FairPoint NNE	SRYLVTYA	2,110	86	59	$ 78
S. Strafford	FairPoint NNE	SSFRVTYA	550	37	24	$ 100
St. Albans	FairPoint NNE	STALVTBA	8,211	130	90	$ 43
St. Johnsbury	FairPoint NNE	STBYVTSM	4,201	120	89	$ 53

Exchange	Telephone Company	CLLI Code	Locat-ions	Total Exch'g Area	Inhab-ited Area	Monthly Cost per Location
Stowe	FairPoint NNE	STOWVTHI	2,955	80	44	$ 54
Swanton	FairPoint NNE	SWTNVTYO	4,165	106	58	$ 52
Saxtons River	VTel	SXRVVTXA	956	42	27	$ 76
Tunbridge	FairPoint NNE	TNBRVTYA	584	37	27	$ 96
Troy	FairPoint NNE	TROYVTYA	2,163	163	72	$ 85
Underhill	FairPoint NNE	UNHLVTUC	3,266	92	55	$ 58
Vergennes	FairPoint NNE	VRGSVTMO	2,073	53	35	$ 60
W. Burke	FairPoint NNE	WBURVTYA	1,753	126	66	$ 90
Woodstock	FairPoint NNE	WDSTVTGO	2,564	92	73	$ 71
Wells River	FairPoint NNE	WDVLNHJL	293	8	5	$ 80
Whiting	Shoreham	WHNGVTXA	351	28	14	$ 106
Wallingford	VTel	WLFRVTXA	1,082	39	22	$ 66
Wilmington	FairPoint NNE	WLMGVTDA	5,418	132	63	$ 48
Westminster	FairPoint NNE	WLPLNHWP	692	14	12	$ 73
Williamstown	FairPoint NNE	WLTWVTLA	1,182	37	27	$ 73
Windsor	FairPoint NNE	WNDSVTPI	2,073	34	25	$ 48
Winooski	FairPoint NNE	WNSKVTWA	3,050	11	9	$ 29
West Newbury	FairPoint Northland	WNWBVTXA	616	31	22	$ 89
Wardsboro	FairPoint NNE	WRBOVTYA	1,138	64	27	$ 71
White River Jct.	FairPoint NNE	WRJTVTGA	5,111	58	50	$ 32
W. Rutland	FairPoint NNE	WRTLVTBA	1,373	43	23	$ 55
Canaan	FairPoint NNE	WSTWNHBS	503	26	13	$ 82
Waitsfield	Waitsfield & CV	WTFDVTXA	3,791	113	68	$ 65
Waterbury	FairPoint NNE	WTRBVTSW	2,946	98	43	$ 52
Weybridge	Waitsfield & CV	WYBGVTXA	508	30	19	$ 102
Total			296,806	9,615	5,440	