Final Report for the Audit of Verizon Pennsylvania Inc.'s Network Modernization Plan Implementation Progress

Public Version

Presented to: The Bureau of Audits
Pennsylvania Public Utility Commission

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I. Introduction

A. Executive Summary

This report documents the results of the audit by The Liberty Consulting Group (Liberty) for the Pennsylvania Public Utility Commission (Commission) of the Verizon Pennsylvania, Inc. (VPA, Verizon, or the Utility) Sixth Network Modernization Plan Biennial Implementation Update Report (Biennial Update). The VPA Sixth Biennial Update reports VPA's progress in complying with the terms of its Network Modernization Plan (NMP). In its NMP, VPA committed to provide broadband services of various forms and at various levels of coverage by specified dates extending until 100 percent deployed by 2015. The Sixth Biennial Update, which VPA filed on July 2, 2007, reported VPA's progress in meeting these commitments during 2005 and 2006. In 1999, at Docket No. M-00930441 the Commission adopted a set of guidelines for such biennial updates.

The Commission specified that the principal purpose of the NMP audit was to assess whether the VPA's Sixth Biennial Update is accurate and the reported results demonstrate compliance with the Commission's reporting guidelines, NMP-related orders, Act 183, and any other appropriate Commission orders, regulations and guidelines. Liberty's audit encompassed a variety of approaches, including review of VPA's network and financial records, review of VPA's methods and procedures for biennial update reporting, site visits and observation of circuit testing on a random sample basis to provide physical verification of reported results, and recalculation of derived results reported in the Sixth Biennial Update. In the course of the audit, Liberty held 17 interviews with Verizon personnel, submitted 339 data requests, and visited a sample of 23 VPA exchanges throughout VPA's serving area. Liberty also consulted frequently with Commission Staff on the conduct of the audit, and Commission Staff observed interviews and accompanied Liberty on site visits to VPA facilities. Liberty held regular calls, usually weekly, with representatives of Verizon and the Commission Staff to discuss the conduct of the audit and to resolve procedural matters. As it uncovered issues during the audit, Liberty issued formal "preliminary findings" first to Commission Staff and then to Verizon for comment and to resolve any miscommunication or misunderstanding.

Based on its audit and analysis, Liberty drew the following overall conclusions:

- VPA has met its NMP commitments through 2006, with the exception of the commitment to make broadband facilities available in or adjacent to the nearest right-of-way for 100 percent of public schools, health care facilities, and industrial parks.
- VPA has complied with the Commission's NMP reporting guidelines in the VPA Sixth Biennial Update; however, Liberty questions the quality and usefulness of some of the information reported.
- There are a number of flaws in the information reported in the VPA Sixth Biennial Update, including some erroneous reported numbers, some reported quantities based on assumption rather than supported by analysis, and procedural

inadequacies in the reporting. Liberty also noted some aspects of VPA reporting procedures that provided an incomplete or misleading picture of compliance with its NMP commitments or that provide insufficient information about whether it is on track to meet future commitments.

- VPA may need to explore alternative approaches to providing broadband service than it is currently using and/or to commit a larger share of its capital investments to other technologies in order to meet 100 percent broadband availability by 2015.

From its audit, Liberty identified 27 specific findings and 23 related recommendations. Of the 23 recommendations, Liberty assigned high priority to 14, medium priority to eight, and low priority to one. Several of the recommendations concern interpretation of the Commission's reporting guidelines and the usefulness of the reported data. During the course of the audit, Liberty also recommended that there be a workshop including Verizon, Commission Staff, and Liberty to discuss these issues and seek agreement on improved approaches to reporting in future biennial updates. This workshop was held on June 12, 2008, in Harrisburg, PA.

B. Background

Origin of This Audit

In 1993, the Legislature of the Commonwealth of Pennsylvania adopted Chapter 30 to Title 66 of the Pennsylvania Consolidated Statutes with the intention of providing the possibility of alternative regulation for incumbent local exchange telecommunications companies (ILECs) while at the same time encouraging such companies to enhance their networks to make advanced telecommunications services widely available to Pennsylvania customers. The November 30, 2004, Act of 2004, P.L. 1398, No. 183 (Act 183) established the current form of Chapter 30.

According to the provisions of Chapter 30, an ILEC may seek an alternate (generally lessened) form of regulation, if it submits and the Pennsylvania Public Utility Commission (Commission) approves a NMP. An NMP outlines the ILEC's commitment to meeting the various requirements and goals of Chapter 30. VPA filed, and the Commission approved, the VPA NMP. VPA has amended this NMP since it was originally filed, with the latest amendments being the Third Supplement (2003) and the Fourth Supplement (2004). The Fourth Supplement addressed changes resulting from Chapter 30 introduced through Act 183.

The Commission adopted an order at Docket No. M-00051872, *et al.* (entered October 28, 2005) concerning the auditing of incumbent local exchange carriers' NMPs consistent with the provisions of Act 183, 66 Pa. C.S. §§3011-3019. In its order, the Commission concluded that it would require an audit (NMP Audit) of VPA's reported progress at the time of VPA's next report on that progress, which was anticipated in June 2007.

Pursuant to this order, the Commission issued Request for Proposal RFP-2006-3 (RFP) on November 21, 2006. Liberty responded with a proposal and was awarded the contract for the audit, which began on June 26, 2007, with a meeting between Liberty and the Commission Staff (Staff). This report documents the results of Liberty's audit. The findings, conclusions, and recommendations contained in the NMP Audit are the findings, conclusions, and recommendations of Liberty only, and, as such, are not necessarily agreed to by the Utility or the Commission.

The Verizon Pennsylvania Network Modernization Plan

The VPA NMP contains several commitments including:

(1) Intelligent Network Signaling – for 100 percent of access lines by 1994.

(2) Integrated Services Digital Network (ISDN) – available for 100 percent of access lines by 2000.

(3) Digital Switching – for 100 percent of access lines by 2000.

(4) Interoffice Facilities Using Fiber Optics or Comparable Technology – for 100 percent of trunks by 2000.

(5) Broadband Availability
- for 50 percent of access lines in 2004
- for 60 percent of access lines in 2006
- for 70 percent of access lines in 2008
- for 80 percent of access lines in 2010
- for 90 percent of access lines in 2012
- for 100 percent of access lines in 2015.

(6) Broadband Availability in the nearest right-of-way for public schools, health care facilities, and industrial parks – for 100 percent of locations by 2005.

(7) Digital Subscriber Line (DSL) Availability in Rural Areas
- for 45 percent of rural lines in 2006
- for 100 percent of rural lines in 2015
- availability gap between business and residence no greater than 10 percent by 2007.

(8) Remote Terminal Deployment – as necessary to meet broadband availability in commitment item (5)

(9) Broadband Availability at 45 Mbps within a commercially reasonable time
- in 50 percent of exchanges by 2004
- in 100 percent of exchanges by 2015.

VPA files reports on progress in meeting its NMP commitments normally every two years (biennial updates) on or near June 30 of the next year following the period reported in the

biennial update. VPA filed its Sixth Biennial Update, which reports on 2005 and 2006 progress, on July 2, 2007. The VPA Sixth Biennial Update is the subject of the NMP Audit.

The NMP Reporting Guidelines

The Commission adopted guidelines for the biennial updates (Chapter 30 Biennial Update Reporting Guidelines or Reporting Guidelines) in its order at Docket No. M-00930441 entered May 17, 1999.[1] These guidelines are:

(1) The biennial updates required pursuant to 66 Pa. C.S. § 3003(b)(6) should provide specific information on how many customers are buying broadband services. This information should be provided both by class of customer, i.e., business, residential, and institutional, and by region or geographic area within each service territory of the filing local exchange carrier (LEC).

(2) Using the same quantity, class, and geographic breakdown outlined in Paragraph No. 1 above, the biennial updates should report the type of broadband services customers are actually subscribing to, including information on the speed of each broadband service being offered by the LEC.

(3) The biennial updates should report present and projected upgrades to switches, fiber deployment, intelligent signaling, and ISDN availability.

(4) The biennial updates should explain the LEC's planned architecture for its broadband network. If the LEC's architecture has been revised substantially from the last biennial update because of changing technology or market environment, the LEC should provide a specific description of the new architecture and the reasons for the change.

(5) The biennial updates should project the LEC's deployment schedule.

(6) The biennial updates should identify broadband availability in or adjacent to public rights-of-way abutting health care facilities, public schools, and industrial parks. For reporting purposes, "public schools" shall include all public school districts within the Commonwealth of Pennsylvania, all intermediate units, all charter schools, and all area vocational-technical schools.

(7) The biennial updates should describe how the LEC is meeting the commitment made in its Chapter 30 network modernization plan to achieve reasonably balanced broadband availability to urban, suburban, and rural areas within its service territory consistent with each company's approved Chapter 30 plan.

(8) Consistent with the reporting obligations contained in 52 Pa. Code §§ 73.1-73.9, for LEC's providing telephone service with over 50,000 access lines or which have grossed intrastate operating revenues in excess of $20 million per year, the

[1] Act 183 modified filing and reporting requirements for local exchange carriers at section 3015(f), 66 Pa. C.S. § 3015(f), and the Commission addressed these new requirements in its Final Rulemaking Order at L-00050176 entered August 21, 2006. However, the Final Rulemaking Order at L-00050176 did not address or otherwise amend the 13 Guidelines or more specifically the NMP reporting requirements pursuant to section 3014, 66 Pa. C.S. § 3014.

biennial updates should provide the level of capital investment being made to develop the broadband network. Specifically, information regarding the historical, current, and projected levels of capital investment in the network as well as updated depreciation report information should be provided. A LEC may coordinate its reporting obligations required by Chapter 73 to comply with this paragraph so long as the LEC complies with the notification requirement contained in 52 Pa. Code § 73.8(6).

(9) For LEC's providing telephone service with less than 50,000 access lines or which have gross intrastate operating revenues less than $20 million per year, the biennial updates should contain information similar to what is required under 52 Pa. Code §§ 73.4 and 73.8. These small LECs may meet with Commission Staff to determine the precise information to be provided so as to balance the Commission's specific informational needs with the LEC's need to minimize any administrative burdens created by the production of this information.

(10) The biennial updates should report on joint ventures.

(11) The biennial updates should report on the status of products and services that enhance the quality of life for those with disabilities.

(12) As provided in the Order approving these guidelines, the acceptance and approval of a network modernization plan and subsequent biennial reports required by Chapter 30, will not eliminate the obligation of a LEC to provide any other reports required in any other chapter of the Public Utility Code or in the Commission's existing regulations.

(13) Proprietary information will be protected so as not to impact adversely competitively sensitive information in the biennial updates by allowing a LEC to file under seal when appropriate; provided, however, that the Office of Consumer Advocate, the Office of Small Business Advocate, and the Office of Trial Staff will have access to this competitively sensitive information subject only to the public advocates entering into appropriate proprietary agreements with the producing LEC.

The VPA Sixth Biennial Update

Verizon filed the Sixth Biennial Update on July 2, 2007, in both a proprietary and a redacted version. Liberty received a copy when Verizon filed it. The Sixth Biennial Update reports VPA's progress in meeting its NMP commitments during 2005 and 2006. It contains the following information:

(1) An executive summary.

(2) A review of the VPA NMP commitments along with a brief explanation of the status of each commitment.

(3) Further description of VPA's progress in deploying DSL service.

(4) Further description of VPA's progress in deploying 1.544 Mbps service.

(5) Further description of VPA's progress in deploying 45 Mbps service.

(6) Further description of VPA's progress in deploying remote terminals.
(7) Further description of VPA's ISDN service status.
(8) Responses to each reporting requirement in the NMP Reporting Guidelines.

Liberty reviewed each of these sections as part of its audit.

The NMP Audit

The Commission in its RFP indicated that the purpose of this NMP Audit was to provide a comprehensive audit to determine whether the VPA Sixth Biennial Update is accurate and the reported results demonstrate compliance with the Chapter 30 Biennial Update Reporting Guidelines; the Commission's Orders at P-00930715 (entered September 17, 2003) and at P-00930715F0002 (entered August 3, 2004, and affirmed in the Commission's Order at M-0051872, *et al.*, entered October 28, 2005); and any other appropriate Commission orders, regulations and guidelines. The Commission specified that the NMP Audit should include a review of company books, records, working papers, and other pertinent documents. In addition, the audit would involve on-site verification of relevant areas and items addressed in the Sixth Biennial Update and the applicable Commission orders, regulations, and guidelines. To the extent they are addressed in the Sixth Biennial Update, the Commission indicated that the NMP Audit would address the following aspects of the NMP implementation progress:

- Availability of all types of broadband services
- Progress in deployment of broadband services to health care facilities, public schools, and industrial parks
- Deployment of fiber optic cable
- Deployment of remote terminals
- Deployment of ISDN
- Deployment of equipment required to provide broadband services
- Other key components as needed.

In addition, the NMP Audit would include:

- Review of capital investment amounts and/or depreciation information
- Accuracy of inventory reporting to the Pennsylvania Department of Community and Economic Development
- Accuracy of biennial lists of central offices and service centers where DSL service is available
- Verification of customer-take rates for various broadband services
- Verification by exchange classification of the types of broadband services offered.

The Commission emphasized in its RFP that a major objective of the NMP Audit was to allow the Commission and its Staff to determine whether VPA's processes for calculating and reporting the information contained in the Sixth Biennial Update produce accurate and reliable results. In addition, the RFP indicates that such a determination would require independent testing, through review of VPA's systems and modes, and through sampling of physical performance, to verify the actual broadband access speeds to the retail customers. The NMP Audit was to be sufficient to determine whether VPA, in conformance with its approved NMP, is providing on a timely basis the appropriate technologies to the urban, suburban, and rural exchange classifications.

The RFP lists a set of tasks that, at a minimum, the NMP Audit should include:

(1) Determination of whether the reported availability of broadband service at 45 Mbps at market based rates within a commercially reasonable time frame as of December 2006 is complete, accurate, and verified on a test basis with the information provided in the Sixth Biennial Update and in VPA's billing system. This includes the NMP interim targets to reach a certain percentage of customers by exchange classification (urban, suburban, and rural).

(2) Determination of whether the reported availability of broadband service at 1.544 Mbps at market based rates within a commercially reasonable time frame as of December 2006 is complete, accurate, and verified on a test basis with the information provided in the Sixth Biennial Update and in VPA's billing system. This includes the NMP interim targets to reach a certain percentage of customers by exchange classification (urban, suburban, and rural).

(3) Determination of whether the reported availability of DSL services at speeds less than and greater than 1.544 Mbps to at least 45 percent of rural lines has been achieved by the end of 2006, and that the VPA is on schedule to make the gap between residential and business customers' availability to be no more than 10 percent by the end of 2007.

(4) Evaluation of VPA's processes and procedures for collecting the data necessary to prepare the Sixth Biennial Update.

(5) Evaluation of the internal controls established by VPA to ensure the complete and accurate preparation and submission of the Sixth Biennial Update.

(6) Verification that VPA is using technology to provide broadband service that is consistent with its NMP and of the number of access lines served by each technology.

(7) Review of VPA's outside plant engineering databases and any other systems VPA uses to determine and document each access line's broadband qualification.

(8) Verification, on a statistically valid test basis, the accuracy and reliability of the data in VPA's outside plant engineering databases and any other systems VPA uses to determine an access line's broadband qualification. In answer to questions raised by potential suppliers, the Commission clarified that the statistical requirements for the test sample should be such that it be able to identify, with a 95 percent confidence interval, an observed value that has no more than a five

percent error rate. In addition, the field data is expected to be tested using the hypothesis that the data has a one percent maximum error rate. The RFP also noted that this sample verification be based on a thorough review of the network architecture with physical observation of the technology VPA uses and/or through observation of VPA testing the sample access lines either through a remote test facility or at the customer's premises.

(9) Verification, on a test basis, that the data VPA provides in its Sixth Biennial Update reconciles with the outside plant engineering databases or other supporting information that VPA maintains, and that the data is accurate.

(10) Verification, on a test basis, of the classification of the exchanges and access lines as businesses or residences and urban, suburban, or rural in accordance with applicable Commission orders.

(11) Verification of the VPA's reported actual and projected network capital investment. Verification, on a test basis, that actual investment amounts provided in the Sixth Biennial Update reconciles with the general ledgers, any other subsidiary ledgers, and other supporting documentation. Verification, on a test basis, that projected capital investment provided in the Sixth Biennial Update reconciles with the amounts in the approved and authorized short- and long-term capital budgets.

(12) Determination that the process, procedures, and results of VPA's depreciation studies appear to be reasonable. Verification for a selected sample of accounts that the booked depreciation agrees with the depreciation reported in the depreciation studies and reported, or used as the basis for the data reported, in the Sixth Biennial Update.

(13) Verification, on a test basis, that the April 2007 publicly available semiannual list designating those VPA central offices and services centers in each central office where DSL service is available in Pennsylvania is accurate and complete.

(14) Verification that the reported progress in deployment of broadband facilities in or adjacent to rights-of-way abutting health care facilities, public schools, and industrial parks is in compliance with prior Commission orders and the Public Utility Code at Pa. C.S § 3011(2). Verification, on a test basis, that the details provided in the Biennial Report reconcile with the outside plant engineering databases and other relevant systems VPA uses to document and determine that such broadband facilities are in place. Verification, on a test basis, through physical observation that the details provided are accurate.

(15) Verification that the details of present and projected upgrades to switches, fiber deployment, intelligent signaling, and ISDN availability reconcile with items in the approved capital budget and other available supporting and authorizing information. Determination that VPA is on-track with its projections.

(16) Determination of the status of VPA's use of products and services that enhance the quality of life for those with disabilities. Determination, on a test basis, through review of network architecture and/or direct confirmation with the

customer, the accuracy of the details VPA provides regarding such products and services.

(17) Verification of VPA's progress in installing the equipment necessary to provide each type of broadband services offered to customers.

(18) Verification of the reported types of service offered by exchange classification (urban, suburban, and rural).

(19) Verification of the reported number of residential and businesses customers actually purchasing various broadband services.

C. Liberty's Audit Approach

Liberty organized its audit into five task areas:

a. Task Area 1: Review of VPA's Outside Plant Records and Other Data. This task area included aspects of the following tasks specified in the RFP:

(1) RFP item 1 – availability of broadband at 45 Mbps

(2) RFP item 2 – availability of broadband at 1.544 Mbps or above

(3) RFP item 3 – availability of DSL in rural areas at less than and greater than 1.544 Mbps

(4) RFP item 6 – verification that the broadband technology used is consistent with the NMP and the number of access lines served by each technology

(5) RFP item 7 – review of broadband qualification for access lines in outside plant records

(6) RFP item 9 – reconciliation of outside plant records with reported results in the Sixth Biennial Update

(7) RFP item 10 – verification of the accuracy of the reported exchange classifications

(8) RFP item 13 – verification that VPA's public list of central offices and service centers where DSL is available is complete and accurate

(9) RFP item 14 – verification of reported progress in providing broadband adjacent to health care facilities, public schools and industrial parks

(10) RFP item 16 – verification of the accuracy of VPA's reported use of products for those with disabilities

(11) RFP item 17 – verification of progress in installing equipment to provide each type of offered broadband service

(12) RFP item 18 – verification of reported types of service by exchange classification

(13) RFP item 19 – verification of reported number of residential and business customers purchasing various broadband services.

(14) In addition, Liberty reviewed the accuracy of other items reported in the Sixth Biennial Update not specifically mentioned in the RFP.

b. Task Area 2: Review of VPA's Processes and Procedures. This task area included aspects of the following tasks specified in the RFP:

(1) RFP item 4 – processes and procedures for collecting data to prepare the Sixth Biennial Update

(2) RFP item 5 – internal controls established to ensure a complete and accurate Sixth Biennial Update

c. Task Area 3: Physical Audit of VPA's Outside Plant Equipment. This task area included aspects of the following tasks specified in the RFP:

(1) RFP item 8 – physical verification of actual broadband qualification for a statistically valid sample of outside plant records

(2) RFP item 14 – physical verification of reported progress in providing broadband adjacent to health care facilities, public schools, and industrial parks

(3) RFP item 16 – physical verification of the accuracy of VPA's reported use of products for those with disabilities

(4) Other physical spot checks associated with RPF items 1, 2, 3, 6, 9, 10, and 13.

d. Task Area 4: Review of VPA's Financial Records and Accounting Methods. This task area included aspects of the following tasks specified in the RFP:

(1) RFP item 9 – reconciliation of VPA's supporting financial information with reported results in the Sixth Biennial Update

(2) RFP item 11 – verification that actual investment amounts reported in the Sixth Biennial Update reconcile with the general ledger and other internal accounting data

(3) RFP item 12 – review of depreciation study procedures and reconciliation of booked depreciation with that reported in the Sixth Biennial Update. Upon agreement with Commission Staff, this item was largely dropped from the scope of the audit because VPA is no longer required to report depreciation. As requested by the Commission Staff, Liberty examined the reported depreciation only to the extent necessary to aid in verification of the amount of capital investment Verizon made to deploy broadband services and modernize its network.

e. Task Area 5: Review of VPA's Capital Budget. This task area included aspects of the following tasks specified in the RFP:

(1) RFP item 11 – verification that actual and projected investment amounts reported in the Sixth Biennial Update reconcile with approved/authorized capital budgets

(2) RFP item 15 – verification that the present and projected upgrades to switches, fiber deployment, intelligent signaling, and ISDN reconcile with the approved capital budget.

(3) In addition, Liberty analyzed the VPA network planning and funding process and the capital budgeting process.

In the course of the NMP Audit, Liberty:

- Held 17 interviews with Verizon personnel.
- Submitted 339 data requests of Verizon. Verizon responded to all 339.
- Visited a sample of 23 central offices and neighboring facilities. Liberty also observed Verizon's line testing for broadband qualification and database accuracy.
- Analyzed Verizon data in an attempt to replicate information reported by VPA in the Sixth Biennial Update.
- Consulted frequently with Commission Staff on the conduct of the audit. Commission Staff also observed the interviews and accompanied Liberty on many of the central office and other facility visits.
- Held regular calls, usually weekly, with representatives of Verizon and the Commission Staff to discuss the conduct of the audit and to resolve any procedural matters that arose.
- Issued 41 preliminary findings to Verizon after review by Commission Staff as a means to communicate issues as they arose during the audit and to resolve any misunderstanding or miscommunication. Verizon provided written responses to the preliminary findings. Based on Verizon's responses and further analysis and after combining and revising some of the preliminary findings, Liberty developed the 27 findings of the audit. Based on Verizon's response and in consultation with Commission Staff, Liberty withdrew one preliminary finding, but included the circumstances surrounding that preliminary finding in this report.

Verizon was generally cooperative with and responsive to Liberty's data and interview requests during the course of the audit. Verizon provided documentation, records, supporting data, and access to employees and facilities as requested by Liberty in a timely fashion.

In the remainder of this introduction, Liberty summarizes its conclusions, findings, and recommendations from the audit. In Chapter II, Liberty describes the work of Task Areas 1 and 2 and provides details of the findings and recommendations from this work. In Chapter III, Liberty

describes the work of Task Area 3 and provides details of the findings and recommendations from this work. In Chapter IV, Liberty describes the work of Task Area 4 and provides details of the findings and recommendations from this work. In Chapter V, Liberty describes the work of Task Area 5 and provides details of the findings and recommendations from this work. Liberty also includes appendices that provide more detail about its statistical approach and define various terms used in this report.

D. Conclusions and Summary of Findings and Recommendations

Overall Conclusions

- Liberty's analysis indicates that VPA has met its commitments through 2006 incorporated in its NMP, with the exception of the commitment to make broadband facilities available in or adjacent to the nearest right-of-way for 100 percent of public schools, health care facilities, and industrial parks.
- Liberty's analysis indicates that VPA has complied with a literal interpretation of the Commission's NMP reporting guidelines in the VPA Sixth Biennial Update.
- However, Liberty has found some flaws in the information reported:
  - Some reported numbers are erroneous.[2]
  - Some reported numbers are based on assumption rather than actual data or derived from incomplete or inaccurate data sources.
  - Some reported numbers are derived manually and with insufficient quality checks.
  - Some of the reported information provides an incomplete or misleading picture of the status of VPA's compliance with its NMP commitments.
  - The reported information on planned capital investment provides insufficient information to assure the Commission that VPA is on track to meet its future NMP commitments.
  - Many of the assumptions VPA has made reporting its compliance with the NMP commitments in the Sixth Biennial Update will be insufficient in future biennial updates as VPA's NMP targets become more stringent.
- VPA may need to explore alternative approaches to providing broadband service than it is currently using and/or to commit a larger share of its capital investments to other technologies in order to meet 100 percent broadband availability by 2015.
- Liberty has 27 specific findings and 23 related recommendations as noted below. Several of the recommendations concern interpretation of the Commission's NMP

[2] Verizon provided amendments to the Sixth Biennial Update on September 17, 2007, and April 22, 2008, to correct errors Liberty found.

Reporting Guidelines and the usefulness of the data currently being reported. During the course of the audit, Liberty also made an overall recommendation that there be a workshop including Verizon, Commission Staff, and Liberty to discuss these issues and seek agreement on improved approaches to reporting in future biennial updates. This workshop was held on June 12, 2008, in Harrisburg, PA.

Table A below summarizes Liberty's specific findings and recommendations from the audit. Liberty has also assigned a suggested priority to each recommendation, as follows:

- High Implementation of the recommendation will have a significant impact on the quality and/or usefulness of data used for future VPA biennial updates. Implementation will also resolve outstanding interpretation issues with the NMP reporting guidelines.
- Medium Implementation of the recommendation will improve the accuracy and usefulness of the data reported in the VPA biennial updates.
- Low Implementation of the recommendation will improve the format of the VPA biennial updates to make them more understandable or will allow for ease of auditing the reported data.

Table A

Summary of Findings and Recommendations

Finding No.	Description	Recommendation	Priority
1-1	VPA uses assumption rather than actual data to report its results toward meeting the NMP requirement to provision broadband service at data speeds of 45 Mbps or greater within a commercially reasonable timeframe.	Recommendation 1-1: Verify that VPA has sufficient spare fiber capacity in all of its central offices to meet its stated level of compliance with the NMP commitments prior to issuing future biennial updates.	High
1-2	Verizon does not have a mechanized or standardized method for inventorying its fiber cable facilities.	Recommendation 1-2: Implement the systems and software required to mechanize VPA's fiber facility records. Until such a mechanized system is developed and operational, standardize the method used for maintaining the manual fiber facility records.	Medium
1-3	VPA's method for reporting its provisioning performance on 1.544 Mbps service and 45 Mbps and above service provides incomplete and potentially misleading information regarding VPA's actual service performance compared to the NMP commitments.	Recommendation 1-3: Adjust the reported broadband availability percentages to account for orders not meeting the required provisioning intervals (10 days of a customer's request for 1.544 Mbps and above, and 60 days for 45 Mbps and above). Also, report more useful information in the biennial updates	High

Finding No.	Description	Recommendation	Priority
		to show the percentage of orders provisioned within the required provisioning interval and the average time it took to provision the orders that did not meet the required interval.	
1-4	Verizon's methods for determining the results reported in its biennial updates need additional quality checks for accuracy.	Recommendation 1-4: Mechanize the NMP reporting process and calculations as much as possible in order to minimize the impact of human error. Implement an internal audit process that reviews the information reported in the VPA biennial updates before issuing them, and maintain a full audit trail of all the data and figures VPA reports in its biennial updates.	High
1-5	The broadband customer count data provided by VPA in its Sixth Biennial Update did not provide information that is useful or reliable.	Recommendation 1-5: Reach an agreement with the Commission Staff on what data must be reported in future biennial updates to provide useful information on the utilization of broadband services and the growth of these services over time.	High
1-6	Verizon's method for determining broadband availability at 1.544 Mbps or greater does not accurately reflect actual broadband availability in Pennsylvania.	Recommendation 1-6: Implement a revised broadband availability identification process that more accurately represents Verizon's ability to support broadband DSL service in its network.	High
1-7	VPA did not include all of its FiOS lines in the calculation of the percentage of broadband capable lines in its Sixth Biennial Update.	Recommendation 1-7: Implement the systems development necessary to include all of its FiOS lines in future biennial updates.	High
1-8	VPA's methods for converting FiOS facilities to access line quantities and for reporting rural DSL availability in the Sixth Biennial Update may distort VPA's reported broadband availability.	Recommendation 1-8: Use a universal standard unit for calculating VPA's broadband availability percentage in future biennial updates.	High
1-9	VPA's results for broadband availability in its Sixth Biennial Update include lines that are not readily available for broadband service.	Recommendation 1-9: Include only lines readily available to support broadband service in the numerator of the percentage availability calculation.	Medium
1-10	Information provided by Verizon's Golden Source database is not consistent with information provided	Recommendation 1-10: Use consistent data sources for reporting broadband availability in the	Medium

Finding No.	Description	Recommendation	Priority
	by Verizon's online website.	biennial updates and for reporting broadband availability on Verizon's website, including only lines that are readily available for the provision of broadband service.	
1-11	Verizon is not consistent in its treatment of orders delayed due to customer-caused reasons when reporting the percentage of access lines available for broadband service within ten business days at data speeds of 1.544 Mbps or greater.	Recommendation 1-11: Exclude all orders that were delayed for customer-caused reasons from the performance calculation.	Medium
1-12	Liberty was unable to replicate VPA's reported results for broadband and rural DSL availability in is Sixth Biennial Update.	Recommendation 1-12: Clearly document the process used to calculate the broadband availability percentages reported in the biennial updates to provide a clear audit trail to support the results.	Low
1-13	The DSL customer count data provided by Verizon in its biennial updates does not appear to provide information useful for determining the number of in-service DSL lines or the growth of DSL service in Pennsylvania.	Recommendation 1-13: Report the number of DSL lines in service at the end of the reporting period disaggregated by each of the three exchange classifications in addition to (or in lieu of) reporting the number of internet service providers and content providers in future biennial updates. Also report the number of DSL lines in service at the end of the reporting period for the past two biennial updates to provide the information needed to determine the growth rate for DSL service.	High
1-14	VPA's reported results for broadband availability in or adjacent to the nearest right-of-way for public schools, healthcare facilities, and industrial parks in its Sixth Biennial Update do not accurately represent VPA's actual progress.	Recommendation 1-14: Propose a definition of the requirements of the NMP commitment to have broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks and obtain agreement on this definition from the Commission Staff.	High
1-15	Based on its interpretation of Act 183, Verizon indicated that it is no longer legally required to place fiber in or adjacent to the nearest right-of-way for any new public schools, health care facilities, or industrial parks constructed after December 31,	Recommendation 1-15: Determine the requirements for compliance with the NMP commitment to have broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks.	High

Finding No.	Description	Recommendation	Priority
	2005.		
1-16	Verizon's process for provisioning broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks does not provide an audit trail to enable verification that VPA has complied with this NMP commitment.	Recommendation 1-16: Develop an updated centralized master list of public schools, health care facilities, and industrial parks and continue to update this list when new facilities are added and others are retired.	Medium
1-17	The fiber optic cable conductor miles reported by VPA in its Sixth Biennial Update do not depict the actual conductor miles available for service in Pennsylvania.	Recommendation 1-17: Modify reporting of fiber facilities that Verizon has deployed and that are available for customer service in future biennial updates to account for fiber cable conductor miles that have been retired.	Medium
3-1	Verizon's Network Engineering Fiber Optic Cable Inventory Records do not accurately reflect the number of actual working fibers or the number of spare fibers in VPA's network.	Recommendation 3-1: Conduct a statewide internal audit to compare the working and spare fibers in the central office to VPA fiber facilities inventory records and update the facility inventory records so that they accurately reflect the actual working and spare fiber strands in VPA's network.	High
3-2	VPA's inconsistent methods for maintaining its fiber facility records may result in inaccurate records and an overstatement of the actual spare fiber facilities available for service in a central office.	There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-2.	See Recommendation 1-2
3-3	Liberty's physical audit of VPA's outside plant facilities revealed that VPA did not have fiber facilities available in or adjacent to the nearest right-of-way for 100 percent of the public schools, health care facilities, and industrial parks as reported by VPA in its Sixth Biennial Update.	There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-14.	See Recommendation 1-14
3-4	DSL data speed line testing indicates VPA's assumption that loop length is the sole determinant of broadband availability for NMP reporting purposes is inaccurate.	There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-6.	See Recommendation 1-6
3-5	Verizon's Golden Source database, which it used to report broadband availability in the VPA Sixth Biennial Update, does not always	There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation	See Recommendation 1-6

Finding No.	Description	Recommendation	Priority
	reflect the most accurate loop-length information available to Verizon.	1-6.	
4-1	Verizon did not adequately define or consistently report capital broadband investment in the VPA Sixth Biennial Update, dated July 2, 2007.	Recommendation 4-1: Report the composition of capital expenditures consistently in the VPA biennial updates and explicitly label the types of capital expenditures reported.	Medium
4-2	In the VPA Sixth Biennial Update, dated July 2, 2007, Verizon reported capital investment in categories that do not allow a determination of the total Pennsylvania investment by network technology.	Recommendation 4-2: Work with the Commission Staff to achieve agreement on the categories of capital investment to be reported in future biennial updates.	High
4-3	Verizon overstated the 2006 FTTP capital expenditures in its VPA Sixth Biennial Update.	Recommendation 4-3: Review internal controls, validation of work documents, and staffing to ensure accurate reporting of the financial data in VPA's biennial updates.	High
5-1	The VPA Sixth Biennial Update reported a projected capital commitment budget that fails to provide the Commission an adequate view of the capital requirements and construction plans required to remain on schedule to meet the 2015 NMP broadband commitments.	Recommendation 5-1: Provide sufficient information in the biennial updates to support its ability to meet its 2015 NMP commitments, in addition to providing its projected commitment budget for the first year after the reporting period.	Medium
5-2	Verizon misreported the projected levels of 2007 capital investment for the DSL, FTTP, and SONET ring IntelliLight budget categories in the VPA Sixth Biennial Update.	Recommendation 5-2: Review internal controls, validation, and staffing to ensure accurate reporting of the capital budget data in VPA's biennial updates.	High

II. Task Areas 1 and 2: Non-Financial Records and Reporting Process Review

A. Purpose and Background

In Task Areas 1 and 2, Liberty examined the data sources that VPA used to provide all information reported in the Sixth Biennial Update aside from financial and capital budgeting information.[3] Liberty analyzed the accuracy and completeness of the Sixth Biennial Update data provided by VPA based on those data sources. In particular, Liberty examined whether VPA properly extracted the data, executed the calculations, and tabulated the results from these sources to produce the information it presented in the Sixth Biennial Update. Liberty also reviewed the processes and procedures used by VPA to produce, accumulate, classify, and verify the data used for the biennial update. The scope of these two task areas was derived from the following tasks listed in the Commission's RFP:

1. Review and evaluation of the accuracy of the data used by VPA to report the availability of broadband services at 45 Mbps or greater (RFP item #1).
2. Review and evaluation of the accuracy of the data used by VPA to report the availability of broadband services at 1.544 Mbps or greater (RFP item #2).
3. Review and evaluation of the accuracy of the data used by VPA to report the availability of DSL in the rural areas of Pennsylvania (RFP item #3).
4. Evaluation of VPA's processes and procedures for collecting the data necessary to prepare the biennial update (RFP item #4).
5. Evaluation of the internal controls established by VPA to ensure the complete and accurate preparation and submission of the biennial update (RFP item #5).
6. Verification that the broadband technology used by Verizon and the number of access lines served by each technology type is consistent with Verizon's reported results (RFP item #6).
7. Review of the broadband qualification of access lines as recorded in Verizon's outside plant inventory records (RFP item #7).
8. Reconciliation of VPA's inventory records with results reported by VPA in its Sixth Biennial Update (RFP item #9).
9. Verification of the accuracy of VPA's reporting by exchange classification (i.e. urban, suburban and rural) (RFP item #10).
10. Verification that information VPA makes available to the public regarding DSL availability is complete and accurate (RFP item #13).
11. Verification of VPA's reported progress in providing broadband facilities in or adjacent to public schools, health care facilities and industrial parks (RFP item #14).

[3] The data sources associated with the financial systems and capital budgeting are addressed in the Task Areas 4 and 5 chapters of this report.

12. Verification of the availability and use of VPA products targeted for telecommunications customers with disabilities (RFP item #16).
13. Verification of VPA's progress in installing equipment to provide each type of broadband service offered in Pennsylvania (RFP item #17).
14. Verification of the accuracy of VPA's reported service availability by each of the three exchange classifications (RFP item #18).
15. Verification of the reported number of residential and business customers purchasing VPA's various broadband products (RFP item #19).

In addition, Liberty reviewed the accuracy of other items reported in the Sixth Biennial Update not specifically mentioned in the RFP.

B. Analysis

Availability of broadband services at 45 Mbps and greater within a commercially reasonable timeframe

In its NMP, VPA committed to provide broadband availability at 45 Mbps or greater to 50 percent of its exchanges by the end of 2004 and 100 percent of its exchanges by 2015. In its Sixth Biennial Update, VPA reported that it is currently able to provision broadband service at 45 Mbps and above within commercially reasonable timeframes in all of its exchanges, and to all but a very small percentage of the most remote access lines in those exchanges.[4] VPA defines availability of broadband services at 45 Mbps and greater as having the required facilities in place to allow for provisioning of a customer service request in a commercially reasonable time period of 45 to 60 business days.[5] The Commission approved the 45- to 60-day interval for VPA's 45 Mbps and higher service in the Opinion and Order entered September 17, 2003 in P-00930715F0002.[6] VPA explained that its statement in the Sixth Biennial Update that it is able to provision these broadband services "to all but a very small percentage of the most remote access lines" refers to the areas of the most rural of VPA's wire centers where fiber deployment would require significant capital outlay.[7] Verizon indicated that it is not typical for business customers in these areas of the state to require broadband service at data speeds of 45 Mbps. However, VPA stated that it is prepared to deploy such service should the demand arise.[8]

VPA indicated that it maintains a level of spare fiber facilities and fiber optic multiplexer cages in its central offices to allow it to respond to service requests for 45 Mbps and higher services within commercially reasonable timeframes. VPA designed its outside plant feeder facility

[4] VPA Sixth Biennial Update, pp. 8 and 9.
[5] Response to Data Request #30.
[6] Response to Data Request #81.
[7] VPA uses fiber-based equipment and facilities to provision broadband service at data speeds of 45 Mbps or greater, according to the responses to Data Requests #101 and #126.
[8] Response to Data Request #68.

network with spare fibers in anticipation of engineering the work orders needed to extend fiber connectivity to the end-user location of a customer ordering a 45 Mbps service. As work orders are engineered that use these spare fibers for service requests, VPA's standard process is to place additional fiber cables in its feeder network to maintain a sufficient inventory of spare capacity. VPA also indicated that it maintains spare SONET multiplexer cages in its central offices to allow for short turnaround on service orders requiring fiber-based technology.[9]

Liberty interviewed Verizon's subject matter experts about the process used for collecting data to determine that services at 45 Mbps and above were ubiquitously available throughout VPA's service footprint as reported in the Sixth Biennial Update.[10] VPA indicated that it does not perform any studies or data analysis to reach this conclusion; instead, VPA assumes it met this commitment "by design," based on its fiber deployment practice to have spare fiber facilities available in each of its central office service areas.[11] This is discussed in more detail in Finding 1-1.

In order to assess VPA's claim that it had met its commitment by design, Liberty reviewed the process used by VPA for its fiber deployment planning.[12] VPA indicated that the number of spare fibers in a feeder route varies from central office to central office based on the forecasted demands of each individual fiber feeder route. VPA maintains a "buffer" of spare fibers in each fiber route, and the size of the buffer depends on the level of anticipated demand. VPA provided Liberty with a copy of its Network Planning "Fiber Engineering and Sizing Guidelines" for its review.[13] Liberty found these Guidelines to be comprehensive. Liberty also reviewed the process used by VPA to maintain its inventory of the working and spare fiber facilities used to provision broadband services at data speeds of 45 Mbps or greater. Liberty found that VPA relies on non-standardized methods for inventorying its working and spare fiber facilities.[14] This is discussed in more detail in Finding 1-2.

Liberty interviewed Verizon's subject matter experts to determine the processes and data sources VPA used to determine that it was making 45 Mbps and greater broadband service available within the 45- to 60-business-day interval required by its NMP commitments.[15] Liberty found that VPA was providing an incomplete and potentially misleading indicator of its performance toward meeting this objective by reporting its average installation intervals rather than reporting the percentage of orders completed within the 60-day timeframe.[16] This is discussed in more detail in Finding 1-3.

Although Liberty believes the use of average installation intervals is misleading, Liberty attempted to replicate the average interval results for the provisioning of broadband services at

[9] Response to Data Request #13.
[10] Interview #3, September 25, 2007.
[11] Response to Data Request #184.
[12] Interview #2, September 11, 2007.
[13] Response to Data Request #71.
[14] Responses to Data Requests #108, #125, and #236.
[15] Interview #5, September 18, 2007
[16] Response to Data Request #152.

45 Mbps or greater that VPA reported in the Sixth Biennial Update, using the same service order data VPA used to calculate these intervals. These data were extracted from VPA's Exchange Access Control and Tracking (EXACT) and Circuit Provisioning Center Information Reports System (CPCIRS) systems for all orders provisioned during 2005 and 2006.[17] Liberty found that the initial data provided by Verizon, though containing all transactions for 2005 and 2006, had insufficient accompanying information for Liberty to be able to replicate Verizon's results. As a result, Liberty asked for basic definitions of the data fields in the data Verizon provided and indicated that Liberty's calculations were inconsistent with Verizon's.[18] In response, Verizon discovered that it had incorrectly reported the average installation intervals in the Sixth Biennial Update,[19] as noted in Finding 1-4. Verizon provided a revised calculation of the intervals, and Liberty was able to replicate VPA's revised results.

Liberty also reviewed this service order data to determine the number of orders that experienced a non-customer-related jeopardy and the number of orders that were not completed within 60 days.[20] Non-customer related jeopardy orders are those orders that missed the provisioning due date as a result of VPA's inability to meet the date. Examples include lack of spare facilities, lack of central office terminations and work force issues. VPA reported average installation intervals of **(Begin Proprietary) (End Proprietary)** days in 2005 and **(Begin Proprietary) (End Proprietary)** days in 2006 and that it provisions these orders within a commercially reasonable timeframe (60 business days) in 100 percent of its exchanges. Liberty found that VPA did not provision some of these orders within the required 60-business-day timeframe; however, based on additional information VPA provided, only about one percent of all orders for services at 45 Mbps and above exceeded the 60-business-day window.[21]

Liberty reviewed the process used by VPA to produce the counts of customers for broadband services in Attachment A of its Sixth Biennial Update.[22] VPA used the customer service records from its Carrier Access Billing System (CABS) and Customer Record Information System (CRIS) billing systems as the source data for these customer counts. VPA also used its Access Line Information System (ALIS) to determine the unique classes of service and Universal Service Order Codes (USOCs) combinations that indicated a particular broadband product or service. Once VPA identified the USOCs and class-of-service combinations associated with the various broadband services listed in Attachment A, it used the customer service records (CSRs) obtained from its billing systems to identify customers using these various broadband services.[23] After producing these customer-to-product association results, VPA downloaded them to spreadsheets.

VPA's final processing of the customer-count results reported in the Sixth Biennial Update was completely manual. The assumptions, data interpretation, customer counting and summarization

[17] VPA provided this service order data in response to Data Requests #19 and #68.
[18] Data Requests #149, #212, and #239.
[19] Response to Data Request #212.
[20] Response to Data Request #19.
[21] Response to Preliminary Finding #6.
[22] Response to Data Request #14 and Interview #4, September 28, 2007.
[23] Response to Data Request #200.

of the broadband customer data obtained from the CABS and CRIS customer service record extracts were all subject to subjective decisions made by the person calculating the results and were also susceptible to human error. VPA indicated that it implemented this process to meet the Pennsylvanian NMP reporting requirements and VPA does not use it for any other internal or external business process.[24] Liberty found that the customer count data provided by VPA does not provide information that is useful or reliable, as discussed in more detail in Finding 1-5.

Despite its reservations about the usefulness of this information, Liberty attempted to replicate the rural broadband customer count information reported by VPA in the Sixth Biennial Update, using the source data provided by VPA.[25] Liberty found that it could not replicate VPA's reported customer count results for four different product classes. Liberty inquired about the process used by VPA to arrive at its results and to explain the difference between VPA's reported results and Liberty's calculated results.[26] Based on VPA's response and Liberty's further analysis, Liberty concluded that VPA's method inconsistently identified and counted broadband customers. This is discussed in more detail in Finding 1-5.

Availability of broadband at data speeds of 1.544 Mbps or greater provisioned within 10 business days

In its NMP, VPA committed to provide broadband availability at 1.544 Mbps or greater to 50 percent of its access lines by the end of 2004, 60 percent by the end of 2006, and to increasing percentages at two-year intervals eventually reaching 100 percent by 2015. In its Sixth Biennial Update, VPA reported that it has exceeded its end-of-year-2006 commitment.[27]

VPA uses five technologies to provide broadband service at 1.544 Mbps or greater in Pennsylvania. The five technologies are:

- Central-office based (CO-based) DSL
- Packet at Remote Terminals (PARTS) DSL
- Overlay DSL
- DS-1 Service[28]
- Fiber-to-the-Premises (FTTP).

The first three of these technologies involve the deployment of DSL and are designed to use VPA's existing copper network. DSL data speeds vary based on the make-up of the access loop

[24] Response to Data Request #201.
[25] VPA's data was provided in response to Data Request #14. Liberty attempted to replicate only the rural results based on the small number of broadband lines found in the rural areas. Liberty's intent was to replicate the reported suburban and urban reported results if it was able to successfully match the rural customer count results reported by VPA; however, Liberty was unable to replicate the rural customer counts.
[26] Data Requests #261, #291, #292, and #293.
[27] VPA Sixth Biennial Update, p. 6.
[28] This includes the variations of DS-1 service such as ISDN-PRI, Frame Relay DS-1, etc., that VPA makes available to its customers.

facilities that the service uses. VPA combines DSL service with voice service over existing copper pairs[29] for customers within 18,000 feet of a central office.[30] DSL can also provide broadband (1.544 Mbps) service for some customers, depending on the length and other characteristics of the loop facilities employed. DS-1 is a service that is provisioned at data speeds of 1.544Mbps and is capable of being divided to support 24 individual voice/data channels of 64 kbps each. The last broadband option, FTTP, requires the deployment of an additional all-fiber overlay network directly to the customer premises.[31]

CO-based DSL is currently Verizon's most widely used method of provisioning DSL. With CO-based DSL, Verizon places the equipment necessary to provide the service, the digital subscriber-line access multiplexer (DSLAM), in the central office. VPA then provides the service on a direct loop connection from the central-office-based equipment to the customer's premises. At the end of 2006, there remained **(Begin Proprietary) (End Proprietary)** out of a total of **(Begin Proprietary) (End Proprietary)** rural central offices and **(Begin Proprietary) (End Proprietary)** out of a total of **(Begin Proprietary) (End Proprietary)** suburban central offices not equipped to provide CO-based DSL. These central offices are small, with the average number of access lines in the rural and suburban central offices of **(Begin Proprietary) (End Proprietary)**, respectively. These lines account for **(Begin Proprietary) (End Proprietary)** percent of non-activated access lines in the VPA serving area.[32] Verizon plans to equip these central offices by **(Begin Proprietary) (End Proprietary)**.[33]

Verizon's ability to provide CO-based DSL to a customer and the available speed of the connection are largely dependent on the length and make-up of the loop from the central office to the customer's premises. To provide DSL-based broadband service to customers with longer loop lengths, Verizon deploys DSL-capable remote terminals in the field. These remote terminals shorten the length of the copper portion of the loop by connecting the copper loop from the customer's premises to the remote terminal and then connecting the remote terminal back to the central office equipment using high-speed facilities such as fiber. VPA uses two technology types to provide DSL service at the remote terminals, PARTS and Overlay.

With PARTS DSL, the DSL capability is contained within the remote terminal equipment deployed by Verizon, known as next-generation digital loop carrier (NGDLC) equipment. PARTS DSL is provisioned by the installation of the proper plug-in card in the remote terminal. The remote terminal equipment is connected to an Optical Connection Device (OCD) in the central office that delivers the voice signal to the circuit switch and the high speed data signal to the packet network. At year-end 2006, VPA had **(Begin Proprietary) (End Proprietary)** central offices equipped with OCDs to support PARTS DSL.[34]

[29] Response to Data Request #67.
[30] Response to Data Request #16 and VPA Sixth Biennial Update, p. 9. Note that loop make-up variation will result in some loops below 18,000 feet not being capable of supporting DSL service at minimally acceptable data speeds.
[31] Response to Data Request #12.
[32] Response to Data Request #12.
[33] VPA Sixth Biennial Update, p. 23 and response to Data Request #95.
[34] Response to Data Request #127.

For Overlay DSL, VPA deploys the equipment needed to support DSL service adjacent to existing remote terminal equipment not capable of supporting DSL service. VPA refers to the overlay device as a "mini-ASAM."[35] Verizon typically uses Overlay DSL technology in low population areas where the installation of a PARTS solution is not an economical choice.[36]

FTTP requires the deployment of fiber all the way from the central office to a customer's premises. Thus, for areas with existing copper-fed distribution locations, the deployment of FTTP requires the design and construction of new (all-fiber) feeder and distribution facilities. Verizon uses the brand name FiOS for its FTTP-based offering.

Liberty interviewed Verizon's subject matter experts to gain an understanding of VPA's process for collecting and analyzing the data used to report its progress toward meeting the NMP commitment for 1.544 Mbps or greater broadband availability.[37] For NMP reporting purposes, VPA generally determines broadband availability on its local loops based on the length of the loop inventoried in Verizon's Golden Source database.[38] The Golden Source database is a DSL loop qualification application module within Verizon's iView system, the inventory system that stores access line assignment information.[39] For each working telephone number, the Golden Source database shows the loop length, whether the loop is qualified for DSL, and, for loops not qualified, the reason the loop is not qualified. For loop qualification purposes, VPA considers lines with loop lengths of less than or equal to 12,000 feet (12 kft) to be available to support DSL at broadband data speeds of 1.544 or greater; VPA considers lines with loop lengths greater than 12 kft but less than 18 kft capable of supporting DSL at data speeds of less than 1.544 Mbps; and VPA considers lines with loop lengths greater than 18 kft incapable of supporting DSL service at any speed.[40]

Verizon uses two central-office based testing tools to pre-qualify lines for DSL.[41] The older of the two, Mechanized Loop Test (MLT), is a test system designed and deployed by Verizon over 25 years ago as a maintenance test tool. The output from MLT is intended to provide a tester or technician with the information needed to analyze a trouble on a line.[42] However, Verizon uses the loop lengths obtained from a MLT test to populate its Golden Source database when none of the five preferred methods in Verizon's Golden Source database source data hierarchy are available.[43] Verizon indicated that it uses MLT loop lengths only slightly more than two percent

[35] ASAM stands for Asynchronous Transfer mode (ATM) Subscriber Access Multiplexer.
[36] Response to Data Request #67.
[37] Interview #3, September 25, 2007.
[38] Response to Data Request #145 and Interview #3, September 9, 2007. VPA also included the rural FiOS lines found in Verizon's National Telephone Address System (NTAS) in its broadband availability calculation for the Sixth Biennial Update. This is discussed in detail in Finding 1-10 below.
[39] Response to Data Request #314.
[40] Response to Data Request #141.
[41] Response to Data Request #232.
[42] Responses to Data Requests #328 and #329.
[43] Response to Data Request #269. The hierarchy Verizon uses to update its Golden Source database is discussed in more detail in later chapters of this report.

of the time when populating its Golden Source database.[44] One hundred percent of Verizon's switches have MLT test capability.

The second testing tool that Verizon uses for DSL pre-qualification is the Celerity test set.[45] Celerity is a newly developed technology designed and developed as a loop qualifying testing tool and is used solely for that purpose.[46] As of year-end 2006, VPA has Celerity testing capabilities in 26 percent of its central office switches.[47] VPA has indicated that it does not plan to install Celerity test equipment in any additional central offices in the coming budget year.[48] Verizon uses the High Frequency Loss in Decibels (attenuation) data it obtains from its Celerity testing to make a determination of whether the line is i) capable of supporting DSL service at broadband data speeds, ii) capable of supporting DSL service at less than broadband data speeds, or iii) not capable of supporting DSL service at any speed. Verizon's Golden Source hierarchy for updating its Golden Source database ranks Celerity attenuation test results second in priority, and about 21 percent of the Golden Source entries are based on Celerity attenuation test results.[49]

For lines served by the 103 central offices equipped with Celerity test devices, Verizon typically determines broadband availability based on a test of the attenuation on the lines rather than the actual physical length of the loop.[50] Verizon converts the attenuation reading it obtains from these tests into a pseudo-loop-length that it populates in Golden Source. This pseudo-loop-length indicates the data speed the line is capable of supporting. In Golden Source, Verizon assigns loops with attenuation values less than or equal to 47 dB a length of 7.9 kft, it assigns loops with attenuation values between 48 and 56 dB a length of 10.9 kft, it assigns loops with an attenuation value of 57dB a length of 11.9 kft, and it assigns loops with attenuation values between 58 and 70dB a length of 17.9 kft. For lines with an attenuation reading exceeding 70 dB, Verizon inventories the line in its Golden Source database with its actual physical loop length, rather than a pseudo-loop-length, and includes an indicator noting that the line is not available for DSL service at any speed.[51] When analyzing the circuit testing results from Task Area 3, Liberty observed that this method for updating the Golden Source database based on Celerity test results does not always work as designed. This issue is discussed in Finding 3-5 in the Task Area 3 chapter of this report.

For lines served by remote terminals equipped with PARTS or overlay DSL, VPA deploys its remote terminals under a Carrier Serving Area (CSA) guideline. VPA defines a CSA as a planned entity consisting of a distinct geographic area that can be served by a single digital loop

[44] Response to Data Request #310.
[45] Celerity is the generic term used by Verizon for the testing capability that it gets from two different test sets its has deployed in its network, Teradyne Celerity and to a lesser extent Tollgrade Loopcare. Response to Data Request #118.
[46] Responses to Data Requests #228, #328, and #329.
[47] Response to Data Request #118.
[48] Response to Data Request #119.
[49] Responses to Data Requests #269 and #310.
[50] Response to Data Request #118. VPA has 88 offices that are equipped with Celerity test equipment and 15 that are equipped with Tollgrade's Loopcare equipment. Both have similar testing capabilities and VPA tends to use Celerity as the term for the test results obtained from both of these test equipment types.
[51] Responses to Data Requests #220 (revised), #262, and #272 (revised).

carrier remote terminal site. In CSAs, the customer farthest from the remote terminal site must be within the voice-grade serving limit of the properly designed copper cable. VPA limits these cables in length to 12 kft for 22 or 24 gauge cables[52] and 9 kft for 26 gauge cables, including the length of any bridged taps that may be on the lines.[53]

A "bridged tap" is essentially a mechanism to split the signal on a line. However, by splitting the signal, a bridged tap increases the attenuation on the line and may affect the capability of the line to support broadband data speeds. The impact of bridged taps varies depending on the specifics of where the tap is placed, the number of taps on the line and the length of each. Nevertheless, Verizon includes the length of its bridged taps, without adjustment, in the loop length inventoried in Golden Source if the bridged tap is inventoried in Verizon's Loop Facilities Assignments Records System (LFACS).[54] Liberty found that simply adding the length of the bridged tap to the total length of the line does not accurately account for the effect of the bridged taps. This is discussed in more detail in Finding 1-6.

VPA considers all lines served by PARTS or overlay DSL remote terminals broadband available, because, with Verizon's provisioning guidelines, the lengths of these lines between the customers' premises and the remote terminal device supplying the DSL service do not exceed 12 kft. VPA inventories lines served by a PARTS-equipped remote terminal in Golden Source with a loop length of zero kft.[55] Verizon inventories lines served by overlay DSL equipped remote terminals in Golden Source with their actual loop lengths.[56]

Based on interviews, Liberty determined that Verizon performed both a laboratory study and a field test of broadband capability on lines of different loop lengths. These studies showed that most lines with loop lengths over 12 kft are capable of carrying broadband and that a small number of lines with loop lengths of less than 12 kft are incapable of carrying a broadband signal.[57] As indicated in the Task Area 3 chapter of this report, Liberty designed and observed other loop qualification tests that confirmed this observation. This demonstrates that VPA's assumptions for determining broadband data speeds based on loop length for NMP reporting purposes are flawed, as discussed in more detail in Finding 1-6.

Liberty examined VPA's method of reporting its broadband availability. Liberty found that VPA reported the percentage of lines available within ten days as the total percentage of lines with broadband available simply based on how Verizon inventoried the lines in its Golden Source database, without accounting for the fact that some percentage of these lines took more than ten days to actually provision for broadband service. Thus, VPA's method for reporting its

[52] Gauge is a term used to refer to the thickness of the wire in the cable. The lower the gauge, the thicker the wire (*e.g.*, 22-gauge wire is thicker than 26-gauge wire). Thicker wires have less resistance and are therefore capable of carrying higher bandwidth than thinner wires.
[53] Response to Data Request #91.
[54] Responses to Data Requests #130 and #131.
[55] Response to Data Request #220.
[56] Response to Data Request #263.
[57] Response to Data Request #121 and Interview #7, October 9, 2007.

broadband availability based on access line loop length does not accurately represent its ability to make service availability within ten days. This is discussed in more detail in Finding 1-3.

Liberty examined the types of broadband included in VPA's broadband availability results and discussed these results with Verizon subject matter experts.[58] Liberty reviewed each of the line types that VPA included in its reported results by exchange classification (*i.e.,* rural, suburban, and urban).[59] VPA explained that manual effort is required to ensure that it does not count the FiOS line and the traditional wire line to the same premises twice in its NMP reporting results.[60] As discussed in more detail in Finding 1-7, Liberty determined that due to this manual effort, VPA did not include all in-service FiOS lines in its broadband availability results.

Liberty notes that a similar situation applies to DS-1 service. VPA considers the network "pre-provisioned" to provide DS-1 service in areas within 12 kft of the central office or in areas served by a fiber-fed remote terminal. Because these are precisely the areas already counted as broadband available through DSL, VPA does not report any additional broadband availability resulting from DS-1 availability.[61] However, as with FiOS, in a limited number of cases, additional broadband availability exists through DS-1-based services when there is a fiber-fed remote terminal but no PARTS or Overlay DSLAM equipment.

VPA uses working access lines as its basic unit for broadband availability calculation as reported in its biennial updates.[62] However, when calculating its broadband availability on FiOS service, VPA uses working telephone numbers as a surrogate for physical access lines in its calculation. Liberty examined this method of conversion and found that VPA's method may distort its reported availability results. This is discussed in more detail in Finding 1-8.

In calculating results for broadband availability in the Sixth Biennial Update, VPA counted some lines for which there was a capacity relief job in progress. However, these lines are not available for broadband service until VPA completes the relief work. This is discussed in more detail in Finding 1-9.

As specified in the RFP (Item #13), Liberty examined the information VPA makes available to the public regarding DSL availability. In the past, the Commission required that Verizon provide it with a semi-annual list of central offices in Pennsylvania that have DSL available. The Commission Staff informed Liberty that the Commission eliminated the requirement to file the data with the Commission in its Order at Docket No. P-00930715F0002. Instead, the Commission allowed Verizon to satisfy this requirement through the DSL availability information Verizon provides publicly on its website. By using a sample of the working lines found in Verizon's Golden Source database, Liberty compared the systems and databases Verizon uses to respond to queries from its customers on its website with the systems and databases used to produce the broadband availability figures in the Sixth Biennial Update. As

[58] Interview #3, September 25, 2007
[59] Response to Data Request #12.
[60] Responses to Data Requests #85 and #103.
[61] Response to Data Request #338.
[62] Response to Data Request #146.

noted in Finding 1-10, Liberty found differences between the two data sources. From this comparison, Liberty also concluded that Golden Source and hence the Sixth Biennial Update does not provide an accurate picture of actual broadband or DSL availability.

Liberty interviewed Verizon's subject matter experts to determine Verizon's process for maintaining the data found in Golden Source.[63] Verizon stated that it populates the Golden Source loop length data from a variety of sources using the following hierarchy of sources for obtaining information about the loop length.[64]

1. Manual – Golden Source values set by a Verizon user, such as an outside plant engineer. Manual updates by a Verizon user can be based on Terminal, LMU or unknown data sources. Regardless of the data source, these manual updates take priority over all other data that can otherwise automatically update the Golden Source data.
2. HILD – A Celerity test attenuation reading converted to a pseudo loop length, accounting for 21.4 percent of the records in the Golden Source database.
3. LMU – Loop make-up data obtained from Verizon's LFACS database, accounting for 18.2 percent of the records in the Golden Source database.
4. Celerity – Celerity electrical loop length reading (only used if attenuation reading could not be obtained from a Celerity test or if Celerity test indicated an attenuation of greater than 70dB). These records, along with the MLT electrical distance records shown in item 6 of this list, account for 2.2 percent of the records in the Golden Source database.
5. Term – Terminal loop length (used when a specific line has no loop make-up data available). Terminal length uses the median length of all pairs working at the same terminal.[65] Terminal loop length data accounts for 37.1 percent of the records in the Golden Source database
6. MLT – Electrical distance measurement of MLT results.
7. Default –A default pseudo loop length of 17.9 kft that Verizon populates in Golden Source when loop length is unknown for all other methods mentioned above, as long as the loop does not contain load coils per Verizon's LFACS records.[66] Verizon did not provide any data on the percentage of records in the Golden Source database that are based on the default loop length.
8. GIS – A Geographic Information System estimate of loop length. Verizon rarely uses this method for updating the Golden Source data, and it accounts for only a fraction of a percent of the records found in Golden Source.[67]

[63] Interview #17, January 21, 2008.
[64] Responses to Data Requests #269 and #310.
[65] Response to Data Request #288.
[66] Response to Data Request #304.
[67] Interview #17, January 21, 2008.

9. Unknown – Verizon uses this specification when it cannot determine the source system of the loop length data found in Golden Source. An entry of unknown is used as a key for Verizon's engineers to research this entry to determine whether it contains accurate information.[68] 18.2 percent of the records in the Golden Source database are populated with data from an unknown data source.

When a line has multiple inputs of loop length information available on it, Verizon populates Golden Source based on the order the input source appears in this hierarchy. For example, a manual input entered by a Verizon engineer (the first item in the hierarchy) always takes priority over any of the other data sources in the hierarchy.

Verizon indicated that it updates the loop-length information in Golden Source whenever it determines that more current information is available. However, Verizon bases the updates on the hierarchy of data sources shown above.[69] Thus, more current data received from a Celerity attenuation test will not replace older data manually entered into the system, regardless of the age of the manual data. Two of the activities that may result in an update to the Golden Source data include i) an updated Celerity attenuation reading that impacts the loop length value populated in Golden Source and ii) a service order completed for a new POTS line. In addition to these real time updates, Verizon performs scheduled monthly updates to the terminal information in Golden Source.[70] Based on the circuit testing conducted as part of the physical audit, Liberty determined that Verizon's process for updating its Golden Source database does not always reflect the most accurate loop length information available to Verizon. This is discussed in more detail in Finding 3-5 in the Task Area 3 chapter of the report.

Liberty reviewed the process and data used by VPA to determine whether VPA was provisioning broadband service at data speeds of 1.544 Mbps within the required ten-business-day interval. As with 45 Mbps service, Liberty found that VPA provides an incomplete and potentially misleading indicator of its provisioning interval performance by reporting its average installation intervals for broadband service at 1.544 Mbps rather than reporting the percentage of orders it completed within the required ten business days. This is discussed in more detail in Finding 1-3. When examining VPA's service orders for broadband service at 1.544 Mbps or higher, Liberty also determined that VPA treated orders delayed due to customer reasons inconsistently when calculating its results. This is discussed in more detail in Finding 1-11.

Liberty also attempted to replicate the calculations VPA quoted in the Sixth Biennial Update related to availability of service at 1.544 Mbps and above. Using the service order data VPA uses for the calculation of the average provisioning intervals for all DSL, FiOS, and DS-1 orders provisioned during 2005 and 2006,[71] Liberty attempted to replicate the average provisioning

[68] Response to Data Request #305.
[69] Response to Data Request #268.
[70] Response to Data Request #289.
[71] VPA pulls this data from CPCRIS, EXACT, Vericheck, and Network Operations Results Mart (NORM),

intervals reported by VPA in its Sixth Biennial Update.[72] However, Liberty could not replicate VPA's reported results, and, as discussed in Finding 1-4, VPA determined that this resulted from an error in VPA's calculations.[73] Using the Golden Source database and Verizon's stated rules for broadband availability, Liberty attempted, but was unable, to replicate the broadband availability results reported in Verizon's Sixth Biennial Update. This is discussed in Finding 1-12.[74]

In its Sixth Biennial Update, VPA reported the number of Internet Service Providers (ISP) and Content Providers (CP) that purchase DSL services from VPA. VPA indicated that it is unable to provide customer count data, service speed, or residence/business breakdown for any ISP/CP using its DSL transport service because it does not have access to the individual ISP/CP proprietary customer records or service data.[75] VPA did not provide any information in its Sixth Biennial Update on the number of DSL lines it provides to these ISP and CP customers. Liberty reviewed the customer count data reported by VPA in the Sixth Biennial Update and found that this data does not provide information useful to determining the number of in-service DSL lines or growth of DSL lines in Pennsylvania. This is discussed in more detail in Finding 1-13.

Liberty determined that VPA does not provide detailed information in its biennial updates regarding the technology it uses to provide broadband service. As a result, Liberty could not make any assessments in this area, as requested in Item #6 of the RFP. Recommendation 1-8 addresses the need for consistency in reporting across different broadband technologies.

Liberty was unable to analyze or verify the number of residential and business customers purchasing VPA's various broadband products as requested in Item #19 of the RFP, because the Sixth Biennial Update does not contain a breakdown of VPA's broadband services by residential and business customers. VPA indicated that the DSL service ordered by its affiliated and non-affiliated partners does not carry a residential or business classification and that VPA has no business purpose for making this determination for a customer's location in any of its pre-qualification, order, or provisioning processes. VPA indicated that while it is hypothetically possible to cross reference VPA's other databases to obtain a residential/business identification based on the customer's address, this cross-referencing would be a time-consuming and burdensome manual exercise that has no business purpose.[76]

Availability of DSL in rural areas at less than and greater than 1.544 Mbps

Liberty reviewed VPA's process for collecting the data and reporting its progress toward meeting its NMP commitment to provide DSL in rural areas. In the Third Supplement to its NMP, Verizon committed to deploy DSL at any speed to 45 percent of its rural ***access lines*** by

[72] Data was provided in response to Data Requests #18, #19 and #21. CPCRIS provides DS-1 retail order data, EXACT provides DS-1 wholesale orders, Vericheck provides DSL order data, and NORM provides FiOS data.
[73] Response to Data Request #213.
[74] Verizon's response to Liberty's Preliminary Finding #23 on this issue resulted in Finding 1-13.
[75] VPA Sixth Biennial Update, p. 11.
[76] Response to Data Request #237.

year-end 2006, with an availability gap between businesses and residences not to exceed ten percent.[77] On page 4 of the Sixth Biennial Update, Verizon provides a table showing that **(Begin Proprietary) (End Proprietary)** percent of rural residence, **(Begin Proprietary) (End Proprietary)** percent of rural business, and **(Begin Proprietary) (End Proprietary)** percent of the rural residence and business combined have DSL availability. Liberty found that in the Sixth Biennial Update, VPA used households for reporting DSL availability in the rural areas although it used access lines for reporting all other broadband availability. Liberty found this approach inconsistent and potentially misleading, as discussed in more detail in Finding 1-8. Additionally, in Finding 1-4, Liberty found that VPA lists incorrect counts for total rural access lines and for the number of those lines capable of supporting DSL service.

Liberty used VPA's data on DSL availability for each rural customer location[78] to determine DSL availability for rural business and residence customers.[79] Liberty notes that it could not replicate VPA's availability results for rural DSL. This is discussed in more detail in Finding 1-12.

Accuracy of the reported exchange classifications

VPA uses three exchange classifications: rural, suburban, and urban. It classifies the customer lines into one of these three classifications based on the exchange classification of the wire center that serves the line. VPA has 221 rural, 126 suburban, and 39 urban wire center exchanges in the state.[80] VPA's exchange classifications are based on the density cell classifications found in VPA's tariffs.[81] At the time the NMP was first established in 1994, VPA classified exchanges in density cells 1 and 2 as urban, exchanges in density cell 3 as suburban, and exchanges in density cell 4 as rural.[82] The Commission approved this method of exchange classification by the order entered July 27, 1994, in Bell Atlantic-Pennsylvania Inc.'s Alternative Regulation Plan, Docket No. P-00930715. In compliance with the Commission order in the proceeding at Docket No. P-00930715F0002 entered August 3, 2004,[83] the third supplement to VPA's NMP re-categorized 26 central offices, with 25 moving from a rural classification to a suburban classification and one moving from a suburban classification to a rural classification.

[77] VPA Sixth Biennial Update, p. 7.
[78] Responses to Data Requests #56, #57, and #218.
[79] According to the responses to Data Requests #183 and #243, VPA uses household addresses, not access lines, to calculate rural DSL availability by business and residence class of service.
[80] Response to Data Request #179.
[81] Responses to Data Requests #5 and #221.
[82] The 2nd revised sheet 1 of VPA's PA P.U.C. Tariff No. 180A provides the definitions of the density cells. It defines density cell 1 as all Philadelphia & Pittsburgh exchanges areas with 9,000 or more working pairs per sq. mile. It defines density cell 2 as all remaining Philadelphia and Pittsburgh City exchanges. It defines density cell 3 as all Philadelphia and Pittsburgh suburban exchange areas and all other central office districts with more than 500 working pairs per sq. mile. It defines density cell 4 as all remaining exchange areas.
[83] Response to Data Request #221.

Using VPA's PUC Tariff 180A, the list of exchanges reclassified by the third supplement to the NMP, and the exchange classification information provided by VPA, Liberty verified that VPA has properly classified its exchanges according to the approved tariff rules.[84]

VPA's reported progress in providing broadband facilities in or adjacent to the nearest right-of-way for schools, health care facilities and industrial parks

In its Sixth Biennial Update, VPA reported that as of year-end 2005 it has met its commitment to make broadband facilities available to 100 percent of the public schools, health care facilities, and industrial parks in the VPA service area.[85] In meeting this commitment, VPA indicated that it placed fiber facilities in the adjacent right-of-way for each school, health care facility, and industrial park.[86] VPA indicated that the statute refers to broadband deployment as "in or adjacent to public rights-of-way abutting" such locations. According to Verizon, the statute does not define "adjacent" or "abutting," and it interprets "adjacent" to mean passing next to the location.[87] VPA indicates that it has complied with this requirement by placing fiber cable facilities in either the public or the private right-of-way adjacent to the property upon which the qualifying location resides.

Verizon provided Liberty with its master list of public schools, industrial parks, and health care centers in VPA territory for which VPA indicated that it provisioned fiber facilities in or adjacent to the nearest right-of-way.[88] Liberty compared the Verizon list with samples taken from independent lists on public internet sites, a list of skilled nursing centers provided by the Pennsylvania Department of Health, and a list of schools provided by the Pennsylvania Department of Education. Liberty found that a number of institutions from the independent lists did not appear on Verizon's list. In addition, Verizon had not made fiber available to 24.2 percent (52 of 215) of the institutions found on Liberty's lists that did not also appear on VPA's master list, and Verizon had made little effort to keep the lists current for at least several years, despite readily available information.[89] This is discussed in more detail in Finding 1-14. As noted in Finding 1-15, Verizon also indicated that it has interpreted Act 183 to mean that there is no longer a requirement to place fiber in or adjacent to the nearest right-of-way to these facilities after 2005.[90] Finally, as discussed in more detail in Finding 1-16, Liberty found that VPA's process for reporting its compliance with the requirement to make broadband available to public schools, industrial parks, and health care facilities does not provide for a verification audit trail.

[84] Responses to Data Requests #5 and #15.
[85] VPA Sixth Biennial Update, pp. 3 and 6-7.
[86] Response to Data Request #43.
[87] Response to Data Request #207.
[88] Response to Data Request #10.
[89] Responses to Data Requests #206, #265, and #266 for missing schools, health care facilities, and industrial parks, respectively.
[90] Response to Data Request #177.

The availability and usefulness of products, offered by VPA, for those with disabilities

Liberty reviewed the products and services that VPA offers to customers with disabilities. This list includes the following products and services targeted specifically to customers with disabilities:[91]

- VPA staffs a call center with specially trained service representatives who are trained to understand the needs of customers with disabilities. This center, known as Verizon Center for Customers with Disabilities, is directly accessible by telephone or via TeleTypewriter (TTY). This call center, located in Marlboro, Massachusetts, serves the states formerly served by Bell Atlantic and NYNEX. [92]
- VPA provides directory assistance and operator privilege exemptions for visually or mobility impaired customers.
- VPA offers adaptive equipment that assists people with disabilities in connecting to the public switched network. This equipment includes amplified phones, large button phones, and signalers.
- VPA makes alternate bill formats such as large print and Braille bills available to the visually impaired.

Liberty obtained the ordering volumes for some of these products and the call volumes into Verizon's Center for Customers with Disabilities and found that as of July 2007, Verizon had **(Begin Proprietary) (End Proprietary)** customers subscribing to Braille bills and **(Begin Proprietary) (End Proprietary)** subscribing to large print bills in Pennsylvania. VPA also has **(Begin Proprietary) (End Proprietary)** customers that have directory assistance exemptions and **(Begin Proprietary) (End Proprietary)** customers that have operator exemption privileges. Verizon sold **(Begin Proprietary) (End Proprietary)** adaptive equipment units to Pennsylvania customers during 2005 and 2006.[93] Verizon handled **(Begin Proprietary) (End Proprietary)** calls in 2005 for Pennsylvania and Delaware and **(Begin Proprietary) (End Proprietary)** calls in 2006 for Pennsylvania, Delaware, and New Jersey to its Center for Customers with Disabilities.[94] Liberty also verified the availability of these products by obtaining samples of its large print and Braille bills for examination.[95] Liberty determined that VPA does offer its disabled customers a wide array of services and products to help with their special needs for telecommunications services.

[91] Response to Data Request #39.
[92] Response to Data Request #97.
[93] Response to Data Request #106.
[94] Response to Data Request #107.
[95] Response to Data Request #245.

Other items reported in the Sixth Biennial Update

In the Sixth Biennial Update, VPA reported that as of 1994 it had ubiquitous deployment of intelligent network signaling throughout its network.[96] Intelligent network signaling consists of central office switches, known as Service Switching Points (SSPs), equipped with the Signaling System 7 (SS7) signaling protocol; packet switches known as Signal Transfer Points (STPs); and databases known as Service Control Points (SCPs). The network also consists of the SS7 signal links that connect all of the components of the network together (*i.e.,* SSPs to STPs and SCPs to STPs). VPA engineers STPs, the network components that route all the signaling messages between the switches and the databases, in mated pairs that are mirror images of each other to allow for redundancy of this critical network component. In the event that one of the STPs should experience a failure, VPA has engineered the mated pair to be capable of supporting the entire traffic load. VPA has six pairs of STPs (12 STPs in total) operational in Pennsylvania.[97] Using the STP trunk group data inventoried by VPA in its Trunk Capacity Management database, Liberty verified that each of the host switches that serve VPA's public switched network are connected to one of the six STP pairs in Verizon's network allowing for SS7 signaling.[98] Access lines served by VPA's remote switches get their SS7 signaling capabilities from VPA's host switch.[99] When reporting its NMP results, VPA manually compares the information found in the Trunk Capacity Management database with its Trunks Integrated Records Keeping System (TIRKS) database for accuracy.[100]

In the Sixth Biennial Update, VPA reported that 100 percent of its Pennsylvania access lines had ISDN available to them as of 1995.[101] The original NMP measurements included ISDN because it was one of the original digital consumer services; however, since that time residential ISDN has become a largely obsolete digital service and no longer provides an accurate gauge of broadband availability or deployment. Effective November 25, 2004, VPA grandfathered the availability of residential ISDN service.[102] Liberty reviewed VPA's PA PUC No. 500 tariff, Section 46, to verify that the service was shown as grandfathered and no longer available. Liberty also reviewed the Commission letter dated January 21, 2005, in Docket No. R-00040019, approving the grandfathering of this service. [103]

In the Sixth Biennial Update, VPA reported that 100 percent of its access lines were served by digital switches.[104] VPA has **(Begin Proprietary) (End Proprietary)** public switched network switches, **(Begin Proprietary) (End Proprietary)** of which are host switches and **(Begin Proprietary) (End Proprietary)** of which are remotes. Verizon maintains its inventory of these switches in its Engineering Modeling Tool (EMT), the primary planning tool

[96] VPA Sixth Biennial Update, pp. 3 and 5.
[97] Response to Data Request #6.
[98] Interview #1, September 18, 2007 and responses to Data Requests #6, #7 and #299.
[99] Interview #1, September 18, 2007.
[100] Response to Data Request #6.
[101] VPA Sixth Biennial Update, pp. 3 and 5.
[102] VPA Sixth Biennial Update, p. 13.
[103] Response to Data Request #124.
[104] VPA Sixth Biennial Update pp. 3 and 5

used by VPA's central office planners. Using the data supplied by VPA from EMT, Liberty determined that VPA has deployed Nortel DMS-10 and DMS-100, Alcatel-Lucent 5ESS, and Siemens EWSD switches in its former Bell Atlantic service area. Based on its industry experience, Liberty confirms that all of these are digital switches.[105]

In the Sixth Biennial Update, VPA reported that as of 2000, it had 100 percent of the Interoffice Facilities (IOF) on fiber facility routes. VPA indicated that it has two IOF routes between VPA switches and other Pennsylvania local exchange companies that remain on copper facilities. VPA indicated that it is willing to convert these facilities to fiber when the interconnecting carrier is similarly prepared to modernize its end of the facility.[106] In 2007, VPA converted one of these remaining copper IOF trunk groups to fiber facilities. The only remaining copper IOF trunk group in the VPA network is between VPA's switch in **(Begin Proprietary) (End Proprietary)** and a switch located in **(Begin Proprietary) (End Proprietary)** belonging to **(Begin Proprietary) (End Proprietary)**. VPA indicated that **(Begin Proprietary) (End Proprietary)** has not expressed an interest in converting this route to a fiber facility.[107]

VPA inventories its IOF trunk groups in TIRKS. Liberty examined a sample of the TIRKS records provided by VPA and found all of the VPA IOF trunk groups in this sample on fiber facilities. VPA identified these facilities by the first character of "L" (Light guide) in the "FAC" field of the record. However, when reviewing VPA's copper cable facility records, Liberty found a handful of IOF trunk groups that appeared to use copper facilities. VPA explained that, besides the two copper trunk groups that remain in its network, any records that show IOF trunk groups on copper facilities indicate records of non-working trunk groups that have not been removed from VPA's inventory.[108] VPA explained that these copper spans have been retired and that fiber cables are the only facilities available for assignment for IOF in VPA's inventory system.

In the Sixth Biennial Update, VPA reported the number of remote terminals deployed in Pennsylvania as of year-end 2006. In its Fifth Biennial Update, dated June 30, 2005, which covered the years 2003 and 2004, VPA indicated that its 2005 remote terminal deployment plans included the construction of 126 new remote terminal units. Despite this planned growth, Liberty observed that VPA reported 12 fewer remote terminals in-service for year-end 2006 than the number of remote terminals reported in VPA's Fifth Biennial Update. In response to Liberty's observation, VPA indicated that it had provided an incorrect number of remote terminals in its Sixth Biennial Update due to a reporting error,[109] as noted in Finding 1-4. Liberty's review of the fiber optic cable deployment information provided by VPA in its Sixth Biennial Update found that the fiber optic cable conductor miles reported by VPA do not depict the actual conductor miles available for service in Pennsylvania.[110] This is discussed in more detail in Finding 1-17.

[105] Responses to Data Requests #7 and #242.
[106] VPA Sixth Biennial Update, pp. 3 and 5.
[107] Response to Data Request #66.
[108] Interview #2, September 11, 2007, and responses to Data Requests #11, #136, and #137.
[109] Responses to Data Requests #15 (supplemental) and #98.
[110] VPA Sixth Biennial Update, p. 20 and response to Data Request #193.

Internal Controls established to ensure a complete and accurate Biennial Report

While VPA indicated that it uses oversight procedures to ensure the quality and accuracy of the data used to develop the Sixth Biennial Update,[111] Liberty's review of VPA's processes to develop its biennial updates revealed that these procedures were ineffective. Many of VPA's reporting processes are subject to human error because they are either manual in nature or are based on records maintained manually. Liberty issued a general finding (Finding 1-4) related to the need for additional quality controls for accuracy of reporting. Many of the other findings discussed later in this report relate to VPA's lack of reporting quality. Liberty also found that VPA reported many of the NMP commitments based on manual records and that it has no audit trail that can be followed to verify the accuracy of the reported progress toward the commitment. Additionally, Liberty determined that VPA has no process for conducting internal audits and has never conducted an internal audit on the results it provided in its biennial updates.[112]

C. Findings and Recommendations

Based on its analysis in Task Areas 1 and 2, Liberty has drawn the following general conclusions:

- VPA has met its year-end 2006 NMP commitments with one exception: VPA's NMP commitment to make broadband facilities available in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks.
- VPA's biennial update reporting is flawed, because
  1. Some reported numbers are erroneous;
  2. VPA bases some reported numbers on assumption rather than actual data;
  3. VPA derives some reported numbers from incomplete data sources;
  4. VPA derives some reported numbers manually and with insufficient quality checks; and
  5. Some of the reported information provides an incomplete or misleading picture of the status of VPA's compliance with its NMP commitments.

In support of these general conclusions, Liberty has the following specific findings and recommendations.

[111] Response to Data Request #4.
[112] Response to Data Request #267.

Finding 1-1: VPA uses assumption rather than actual data to report its results toward meeting the NMP requirement to provision broadband service at data speeds of 45 Mbps or greater within a commercially reasonable timeframe.

In the Sixth Biennial Update, VPA indicated that it was able to provision 45 Mbps and above services within commercially reasonable timeframes in 100 percent of its exchanges, and to all but a very small percentage of the most remote access lines in those exchanges.[113] According to Verizon, VPA determined that it met this NMP commitment by design, based on its business practices for fiber deployment. Verizon stated that "because fiber is built out into the network Verizon is able to meet customer requests for high capacity service within commercially reasonable time frames (defined in the NMP as 45 to 60 days), and the average interval data demonstrates that Verizon is in fact meeting these time frames."[114]

Insufficient spare fiber capacity would prevent VPA from meeting this NMP commitment in 100 percent of its central offices. Lacking a mechanized system to inventory its spare fiber facilities, the only way Verizon can verify that this capacity exists in all of its central offices is through an extensive manual effort involving each of its regional engineers. Because it did not perform any such study, VPA assumes, but cannot provide evidence, that it had met this requirement in 100 percent of its exchanges as stated in its Sixth Biennial Update.[115]

Verizon disagreed with Liberty's conclusion, stating that its performance in provisioning service orders for 45 Mbps and above service within a commercially reasonable timeframe is proof that it is meeting this NMP commitment. Verizon also objected to Liberty's comments regarding its process of manually maintaining its fiber facility records in non-standard formats, stating that Verizon's performance in meeting customer requests for service is evidence that its existing manual process functions more than adequately.[116]

Recommendation 1-1: Verify that VPA has sufficient spare fiber capacity in all of its central offices to meet its stated level of compliance with the NMP commitments prior to issuing future biennial updates.

VPA bases its method for reporting its progress in meeting its NMP commitment for service at 45 Mbps and above strictly on its business practice to have sufficient fiber available to meet service demands. Liberty finds this insufficient to justify the assertion that such fiber is actually in place without a specific study. Liberty found that VPA stores its inventory of spare and working fiber facilities on manual records maintained by its regional engineers in non-standard formats. Thus, VPA has no easily verifiable way to determine whether its regional engineers are adhering to its business practices and to provide tangible proof that sufficient spare capacity

[113] VPA Sixth Biennial Update, pp. 4, 8, and 9.
[114] Response to Data Request #184. See also Findings 1-3 and 1-5 regarding Liberty's concerns with Verizon's method for reporting its results toward meeting this commitment using an average interval met on orders provisioned.
[115] Response to Data Request #184.
[116] Response to Preliminary Finding #24.

exists in each of its Pennsylvania central offices to meet this NMP requirement.[117] This matter is addressed in Finding 1-2.

Finding 1-2: Verizon does not have a mechanized or standardized method for inventorying its fiber cable facilities.

Verizon has indicated that it does not have a mechanized fiber cable inventory system for its outside plant non-FiOS fiber cables in Pennsylvania, but that it maintains its inventory of these facilities and their spare capacity using manual records. Additionally, Verizon indicated that it does not have a standard method for maintaining these manual records and that each of its regional engineers have adopted their own method of maintaining these records. Verizon also indicated that it has no plans to develop a system to mechanize its inventory of non-FiOS outside plant fiber facilities.[118]

Verizon's manual, non-standardized process for keeping its inventory of the fiber facilities, used to provision services other than FiOS, has the potential for human error and does not provide Verizon with a reliable method to determine whether spare capacity exists on all of these facilities. This could result in a misreporting of VPA's actual availability of broadband facilities in Pennsylvania.

In response, Verizon indicated "that there is no demonstrated need for a mechanized fiber inventory system for Outside Plant loop fiber used in Verizon Pennsylvania's non FiOS network." Verizon noted that it is unaware of any instances where its existing procedures have failed and indicated that each of its local engineers "is continually aware of the fibers that are in use, the ones that are soon to be placed in service, and the fibers that are currently spare in their geographic area."[119]

Liberty disagrees with Verizon's response and finds manual, non-standard processes for tracking VPA's critical fiber facilities inventory inadequate. Problems with this manual record keeping process were also identified by Liberty during its physical audit, as discussed in Findings 3-1 and 3-2 in the Task Area 3 chapter of this report.

Recommendation 1-2: Implement the systems and software required to mechanize VPA's fiber facility records. Until such a mechanized system is developed and operational, standardize the method used for maintaining the manual fiber facility records.

Non-standard, manual inventory records are prone to human error resulting in inaccurate records. Considering the growth in fiber facilities in VPA's network, investing in a mechanized system for inventorying its fiber network would appear to be prudent. While Liberty recognizes that such a system would take some time and cost to develop and implement, Verizon would be able

[117] Responses to Data Requests #108 and #125.
[118] Responses to Data Requests #108 and #125, and Interview #2, September 11, 2007.
[119] Response to Preliminary Finding #7.

to use such an inventory and tracking system across its entire service footprint and not limit its application to Pennsylvania. Until Verizon develops such a system, VPA should instruct its regional engineers on a standardized method for maintaining the manual fiber facility records to ensure, at a minimum, that the engineers maintain these records based on a standard method and procedure rather than leaving maintenance of these records up to each individual engineer's discretion.

Finding 1-3: VPA's method for reporting its provisioning performance on 1.544 Mbps service and 45 Mbps and above service provides incomplete and potentially misleading information regarding VPA's actual service performance compared to the NMP commitments.

To meet the Chapter 30 broadband availability requirement (66 Pa. C.S. § 3014(b)(5)), VPA must provision residential and business broadband service at speeds of 1.544 Mbps or greater within ten business days of a customer's request. VPA includes DSL services greater than 1.544 Mbps, DS-1 service to a customer, and FiOS in this reporting category.[120] The NMP broadband availability commitment for services of 45 Mbps and above requires such services to be provisioned within commercially reasonable timeframes, which are currently defined as 45 to 60 days.[121]

In its Sixth Biennial Update, VPA reported that it had an average provisioning interval for services at 1.544 Mbps and above of **(Begin Proprietary) (End Proprietary)** business days in 2005 and **(Begin Proprietary) (End Proprietary)** business days in 2006.[122] VPA indicated that it reported results as an average because the NMP did not specify how it should report its provisioning performance results.[123] However, VPA sometimes missed the ten-day provisioning standard,[124] a fact not readily apparent from the reported, average-installation interval result. Similarly, VPA reported that it had an average installation interval for broadband services with bandwidths of 45 Mbps or higher of **(Begin Proprietary) (End Proprietary)** days in 2005 and **(Begin Proprietary) (End Proprietary)** days in 2006.[125] Verizon also sometimes missed the 60-day provisioning standard for these services,[126] although this occurred in only one percent of cases overall.[127]

The simple average is a poor indicator of the distribution of installation intervals. For example, if 50 broadband customers received service in one day and 50 others received service in eleven days, the average interval would be six days even though half of the customers did not receive service within the required ten-day interval for 1.544 Mbps and above services.

[120] Interview #5, September 18, 2007
[121] Response to Data Request #3.
[122] Response to Data Request #1.
[123] Interview #5, September 18, 2007
[124] Responses to Data Requests #18, #19, and #21.
[125] Response to Data Request #1.
[126] Response to Data Request #19.
[127] Response to Preliminary Finding #6.

For example, in 2006, VPA's customers experienced the following results for services at 1.544 Mbps and above:[128]

Table 1-1

Percentage of Orders for VPA Broadband Service at Data Speeds of 1.544 Mbps and Above Provisioned within Ten Business Days During 2006

Type of Service	Percent Provisioned within Ten Business Days
DSL Broadband	**(Begin Proprietary)**
DS-1 Retail	
DS-1 Wholesale	
FiOS	. **(End Proprietary)**

VPA reported that in 2006 it provisioned broadband service to its customers on an average of **(Begin Proprietary) (End Proprietary)** days. However, as shown above, VPA missed the required provisioning interval between **(Begin Proprietary) (End Proprietary)** percent of the time during 2006. Additionally, VPA's monthly on-time provisioning performance for 2005 and 2006 was at times much lower than the annual level. For example, VPA provisioned only **(Begin Proprietary) (End Proprietary)** percent of the DSL orders within 10 business days in December 2005 and **(Begin Proprietary) (End Proprietary)** percent in January 2006. If VPA also reported the percentage of 45 Mbps (DS-3) orders provisioned within the 60-day standard, the Commission would have a more indicative gauge of how well Verizon met the NMP provisioning interval standard.

For services at 45 Mbps and above, Verizon's customers experienced the following results in 2006:[129]

Table 1-2

Percentage of Orders for VPA Broadband Service at Data Speeds of 45 Mbps and Above Provisioned within Sixty Business Days During 2006

Type of Service	Percent Provisioned within 60 Business Days
DS-3 Retail	**(Begin Proprietary)**
DS-3 Wholesale	**(End Proprietary)**

Verizon reported that it provisioned DS-3 service to its customers on an average of **(Begin Proprietary) (End Proprietary)** days. However, as shown above, Verizon did not always meet the required provisioning interval for DS-3 and higher service during the year. When viewed on a monthly basis, Verizon's results vary from a low of **(Begin Proprietary) (End**

[128] Responses to Data Requests #18, #19, and #21.
[129] Response to Data Request #19.

Proprietary) percent in June to a high of **(Begin Proprietary) (End Proprietary)** percent. For retail service, Verizon achieved **(Begin Proprietary) (End Proprietary)** percent performance for only seven months in 2006 and for wholesale service Verizon achieved **(Begin Proprietary) (End Proprietary)** percent performance for only six months.

Liberty also notes that VPA did not adjust its reported availability percentages to account for the fact that it did not always meet the required provisioning intervals of ten business days for 1.544 Mbps and above and 45 to 60 days for 45 Mbps and above. For example, when reporting its progress in meeting the broadband availability commitment in the Sixth Biennial Update, VPA assumed that it met the ten-business-day provisioning interval in all cases. However, the following table represents VPA's actual 2005 and 2006 overall DSL provisioning performance.[130]

Table 1-3

VPA's Provisioning Performance for all Orders for Broadband Service at Data Speeds of 1.544 Mbps and Above During 2005 and 2006

Year	Orders completed	Orders completed within ten business days	Orders completed in 11 business days or more	Percent completed within ten business days
2005	**(Begin Proprietary)**			
2006				**(End Proprietary)**

Thus, VPA failed to meet the ten-business-day provisioning commitment **(Begin Proprietary) (End Proprietary)** percent of the time in 2005 and **(Begin Proprietary) (End Proprietary)** percent of the time in 2006, representing provisioning intervals in excess of ten business days on **(Begin Proprietary) (End Proprietary)** customer orders over the two year period.[131] However, VPA did not adjust its reported availability percentages to account for the frequency with which it fails to achieve the required ten-day interval.

Verizon agreed that it did not provision 100 percent of its orders within the required ten days of the customer's request for 1.544 Mbps and above and 60 business days for 45 Mbps and above. However, Verizon disagreed with Liberty's conclusion that by reporting average intervals Verizon's reporting was incomplete and potentially misleading.[132] Verizon indicated that it reported its provisioning performance results voluntarily, because the NMP Reporting Guidelines do not require any reporting of provisioning intervals. As a result, there is no

[130] Response to Data Request #18.
[131] Liberty acknowledges that these figures also include orders that may have missed the ten business day interval for customer caused reasons. However, during Interview #3 on September 25, 2007, Verizon indicated that it currently has no method of identifying customer caused misses on orders for DSL service.
[132] Responses to Preliminary Findings #3 and #4.

requirement specifying the form for reporting such performance.[133] Verizon also agreed that it did not adjust its reported broadband availability results to account for the frequency with which it did not meet the committed provisioning interval, but noted that it provisioned broadband at 1.544 Mbps or greater within the required ten days **(Begin Proprietary) (End Proprietary)** percent of the time during 2006 for all qualifying orders. However, Verizon believes this is not relevant, because the Commission never required perfect provisioning performance for this or any other purpose.[134] Conversely, Liberty notes that the issue is not that Verizon must provide perfect provisioning performance, but simply that failure to provision within the required intervals represents a failure to meet the existing definition of broadband availability. Moreover, this information enables the Commission Staff to monitor Verizon's success at meeting the broadband provisioning requirement.

> **Recommendation 1-3: Adjust the reported broadband availability percentages to account for orders not meeting the required provisioning intervals (10 days of a customer's request for 1.544 Mbps and above, and 60 days for 45 Mbps and above). Also, report more useful information in the biennial updates to show the percentage of orders provisioned within the required provisioning interval and the average time it took to provision the orders that did not meet the required interval.**

Reporting provisioning performance results based on an average, as VPA did in its Sixth Biennial Update, provides an incomplete and potentially misleading indicator of Verizon's actual performance and thus its status in meeting its NMP commitments. A more accurate indicator of VPA's performance would be the percentage of orders that met the required interval. Without this information the users of the VPA biennial updates could be misled to believe that VPA's results are better than what its customers actually experience.

By adjusting its percentage of broadband availability reported to account for orders that did not make the required interval, VPA will provide a more accurate assessment of its progress toward meeting its NMP commitments. The fact that Verizon does not provision all the orders within the specified interval, to meet the Chapter 30 broadband availability requirement, means that Verizon's actual broadband availability is less than reported in the Sixth Biennial Update. For example, simply adjusting the overall reported availability at year-end 2006 by the **(Begin Proprietary) (End Proprietary)** percent of orders that Verizon failed to complete within the required interval implies an effective availability of **(Begin Proprietary) (End Proprietary)** percent instead of the reported **(Begin Proprietary) (End Proprietary)** percent.[135] Liberty recognizes that using the actual provisioning performance for the two reporting years to estimate expected performance for all broadband qualified lines is an assumption. However, Liberty knows of no reason to believe that this represents a biased estimate. In addition, Liberty does not suggest that this is the only way to adjust the reported

[133] Interview #5, September 18, 2007.
[134] Response to Preliminary Finding #5.
[135] Liberty made this adjustment by multiplying VPA's reported results (68 percent) by its actual on-time performance (94.8).

availability,[136] but Liberty does believe that some adjustment is necessary to indicate the true broadband availability within ten business days.

At the workshop held on June 12, 2008, in Harrisburg, Verizon committed that it will report provisioning performance in future biennial updates as the percentage meeting the commercially reasonable intervals (ten business days for 1.544 Mbps and above, and 60 business days for 45 Mbps and above). Verizon and the Commission Staff agreed that it was not necessary to adjust the broadband availability based on the percentage of orders missing these intervals as Liberty has recommended, but they have agreed to continue discussions as to what constitutes the appropriate benchmark for the percentage orders meeting these intervals in order to qualify as meeting the definition of broadband availability. Liberty believes that once Verizon and the Commission Staff have achieved agreement on these benchmarks, Finding 1-3 will be satisfactorily resolved.

Finding 1-4: Verizon's methods for determining the results reported in its biennial updates need additional quality checks for accuracy.

Through its analysis of VPA's Sixth Biennial Update, Liberty has uncovered a number of reporting inaccuracies. These reporting errors include the following.

- VPA under-reported the number of remote terminals deployed at the end of 2006. In response to Liberty's observation that the 2006 total was 12 less than the 2004 total, Verizon explained that the reported counts dropped because VPA failed to include the remote terminals located in the Philadelphia District in its Sixth Biennial Update. Resulting in the omission of 123 remote terminals.[137]
- VPA used incorrect wholesale data when calculating its average installation intervals for 45 Mbps and higher services resulting in inaccurate reported intervals. VPA reported the average intervals of **(Begin Proprietary) (End Proprietary)** days and **(Begin Proprietary) (End Proprietary)** days for 2005 and 2006 respectively. The correct average interval for 2005 was **(Begin Proprietary) (End Proprietary)** days and the correct average interval for 2006 was **(Begin Proprietary) (End Proprietary)** days.[138]
- VPA used incorrect wholesale T1 data when calculating its average installation intervals for DSL, T1, and FiOS services resulting in inaccurate reported intervals. VPA reported average intervals of **(Begin Proprietary) (End Proprietary)** days and **(Begin Proprietary) (End Proprietary)** days for 2005 and 2006 respectively. The correct average interval for these services in 2005 was **(Begin Proprietary) (End Proprietary)** days and the correct average interval for 2006 was **(Begin Proprietary) (End Proprietary)** days.[139]

[136] A more accurate approach, for example, might be to apply the adjustments each month at the wire center level.
[137] Responses to Data Requests #15 (supplemental) and #98.
[138] Response to Data Request #212.
[139] Response to Data Request #213.

- VPA used an incorrect rural line count in the numerator of its calculation for the percentage of its rural lines available for DSL service. As a result of this error, VPA's reported that **(Begin Proprietary) (End Proprietary)** percent of its rural lines in Pennsylvania are available for DSL service. The correct percentage that VPA should have reported in its Sixth Biennial Update was **(Begin Proprietary) (End Proprietary)** percent.[140]
- The total number of rural access lines reported by VPA did not include a subset of the FiOS lines in-service in the rural areas of Pennsylvania. VPA reported **(Begin Proprietary) (End Proprietary)** access lines. The correct number of rural access lines is **(Begin Proprietary) (End Proprietary)**.[141]
- VPA did not include lines with an Ethernet Service Code Modifier when calculating its 2005 and 2006 provisioning results for broadband services at data speeds of 45Mbps and greater.[142]
- VPA misstated its year-end 2006 results for overall rural residential and rural business DSL availability when calculated using addresses (*i.e.,* locations or households). As a result of this error, VPA reported that DSL was available for **(Begin Proprietary) (End Proprietary)** percent of rural business locations and **(Begin Proprietary) (End Proprietary)** percent of all (business and residential) rural locations. The correct percentages are that DSL was available for **(Begin Proprietary) (End Proprietary)** percent rural business locations and **(Begin Proprietary) (End Proprietary)** percent of all rural locations. Because of this error, VPA also misreported the DSL availability gap between rural business locations and rural residential locations as **(Begin Proprietary) (End Proprietary)** percent. The correct gap percentage is **(Begin Proprietary) (End Proprietary)** percent. VPA also did not make clear in its Sixth Biennial Update that it based these rural business and residential percentages on addresses and not on access lines, which is the basis of all other reporting in the Sixth Biennial Update.[143]

Some of Liberty's other findings also point to the need for additional quality checks. These include:

- VPA overstated the 2006 FTTP capital expenditures.[144]
- VPA's reported results for Broadband Availability in or adjacent to the nearest right-of-way for public schools do not accurately represent VPA's actual progress.[145]
- VPA used inconsistent methods for identifying customers when manually calculating broadband customer counts.[146]

[140] Response to Data Requests #222.
[141] Response to Data Request #223.
[142] Response to Data Request #239.
[143] Responses to Data Requests # 243 and 244.
[144] Finding 4-3.
[145] Finding 1-14.

Liberty acknowledges that none of the reporting errors identified by this finding affect VPA's ability to meet its 2005 and 2006 NMP service commitments. However, this general lack of quality control can lead to inaccurate reporting in future VPA biennial updates and could result in a false indication of whether Verizon actually meets its future commitments.

Verizon agreed with Liberty, but noted that the discrepancies have been minor and that it has amended its Sixth Biennial Update to correct any reporting errors.[147] Verizon indicated that "because much of this data is collected simply to meet NMP reporting requirements and is not produced in the normal course of business, human error becomes more likely." Verizon stated that it will seek to check its data more thoroughly before filing future updates.[148]

Recommendation 1-4: Mechanize the NMP reporting process and calculations as much as possible in order to minimize the impact of human error. Implement an internal audit process that reviews the information reported in the VPA biennial updates before issuing them, and maintain a full audit trail of all the data and figures VPA reports in its biennial updates.

Manual records and processes are inherently vulnerable to human error. These processes are also not easily audited and verifiable. Mechanization will partially remove human error and will provide the data in a form that can be checked and verified. VPA has indicated that it does not perform any internal audits on the data before it publishes its biennial updates.[149] Implementing such a process would eliminate many of the reporting errors uncovered by Liberty during the course of this audit.

Finding 1-5: The broadband customer count data provided by VPA in its Sixth Biennial Update did not provide information that is useful or reliable.

Attachment A of VPA's Sixth Biennial Update, reported the number of VPA's customers for certain broadband services. Verizon sorts these data by exchange classification (*i.e.,* rural, suburban, and urban) and by various broadband services VPA offers its customers (*e.g.*, DS-1 lines, DS-3 lines, SONET services, etc.). However, Verizon's methods for gathering these data for NMP reporting purposes can lead to inaccurate reporting. Liberty's concerns with Verizon's data gathering and reporting process include:

- Verizon indicated that the overall process it uses to identify broadband customer counts was put in place solely for the purpose of providing this information to the Commission and that Verizon does not use it in any of its other business practices. This process contains both manual and mechanized steps which sometimes require manual interpretation of the data to adjust for null values in data fields

[146] Finding 1-5.
[147] Response to Preliminary Finding #1. Liberty verified that all of the issues identified in this finding were corrected by VPA in its April 22, 2008 filing to amend the Sixth Biennial Update.
[148] Response to Preliminary Finding #19.
[149] Response to Data Request #267.

used to identify the customer or for other data anomalies. Additionally, using Excel spreadsheets, Verizon manually processes the customer service record data obtained from extracts of Verizon's CABS and CRIS billings systems, which Verizon uses to generate these customer counts.[150]

- Verizon indicated that the broadband customer count data provided in its biennial updates does not include its customers for "non-access VADI Fast Packet" service or for broadband DSL and FiOS service.[151]
- When the access customer number abbreviation (ACNA) code on a service record belongs to a Verizon affiliate or when Verizon is unable to identify the retail customer by one of the various codes it uses to make a customer identification, Verizon will count each of these records as a unique customer based on address location and broadband product, which has the potential for double counting or undercounting the actual customers using broadband services.[152]

In addition, Liberty attempted to replicate the rural customer count results VPA reported in its Sixth Biennial Update for four of the reported product disaggregations, using the retail and wholesale customer circuits in-service data provided by Verizon for broadband services at DS-1 and higher data speeds.[153] However, Liberty was unable to do so. After investigating the discrepancies between VPA's reported and Liberty's calculated results, which were always lower than VPA's reported results, Liberty determined that the discrepancies resulted from Verizon's process for reporting its customer counts. Verizon counted a circuit record found in its CRIS billing system as a unique customer in its reported results whenever the record for the same customer name contained a unique address. Verizon counted a circuit record in its CABS billing system as a unique customer whenever the record contained a unique five-character ACNA, regardless of the customer's address.[154] When the ACNA contained a three-character code associated with a Verizon affiliate such as "MCI" or "BAM," Verizon counted the records according to the CRIS rules, under which Verizon counts the same customer name as a unique customer for each unique address listed for that customer. The following list provides some examples of how this process affects the customer counts reported by Verizon:

- A business customer in the rural CABS data file has five DS-1 facilities in service at its Quakertown, PA location. However, because it inventories each of these five facilities with unique five character ACNAs, Verizon counts this as five separate customers even though it is the same customer doing business at the same location.
- In the CRIS file, another business customer has 19 DS-1 circuits in service at the same address in Clearfield, PA, which Verizon counts as a single customer.

[150] Interview #4, September 28, 2007 and response to Data Request #201.
[151] Responses to Data Requests #202 and #203.
[152] Response to Data Request #204.
[153] Response to Data Request #14. Liberty could not replicate VPA's reported customer counts for 10 Mbps TLS, Frame Relay DS-1 service, ISDN PRI service, and DS-1 service. Liberty did not attempt to replicate the suburban and urban customer counts reported by VPA because of the problems encountered with its rural replication effort.
[154] Responses to Data Requests #261, #291, #292, and #293.

- A business customer in the rural CABS data file has three Frame Relay circuits in service at three different locations (Smithfield, Rush, and Hilltown, PA). Verizon counts this customer twice, not three times, in its customer counts because the customer has only two unique five-character ACNAs.
- In the rural CABS file a large government customer has 68 DS-1 circuits located in 68 different locations throughout the state all with a three-character ACNA of "MCI." Verizon counts each of these 68 circuits as a unique customer in its NMP report.

Verizon largely agreed with Liberty, reiterating that VPA derives the customer count data reported in its biennial updates solely for the purpose of providing broadband customer counts to the Commission and that it has no other business purpose for this data.[155] Verizon also agreed that its customer counting business rules result in minor variations, but stated that the reasons for these variations were grounded in logical definitions and that the minor differences between Liberty's and Verizon's calculations involve differences in the definition of a "customer."[156]

Recommendation 1-5: Reach an agreement with the Commission Staff on what data must be reported in future biennial updates to provide useful information on the utilization of broadband services and the growth of these services over time.

Liberty recommends reporting the number of actual broadband circuits in service (*i.e.*, the number of physical connections between two or more points) by each of the broadband product classes currently shown in Attachment A to the Sixth Biennial Update (*e.g.*, DS-1 service, DS-3 service, SONET OC3 service, etc.) and by each of the three exchange classifications, and believes that this approach will provide the Commission with a more complete view of the number of these services VPA has sold to its customers. Unlike counts of customers, VPA can readily obtain the circuit count data from its legacy systems, and thus this approach would remove the human error inherent in Verizon's current methods that try to report customer counts. Furthermore, as Verizon notes, ambiguities in the definition of what constitutes a "customer" for different services leads to inherent uncertainty in any attempt to report customer counts at an aggregate level. Reporting by circuit counts will eliminate this ambiguity. By way of example, assume there are four customers that purchase DS-3 services from VPA and customer A has five DS-3 circuits in-service, customer B has 12 DS-3 circuits, Customer C has two DS-3 circuits and customer D has four DS-3 circuits, VPA would report a total of 23 DS-3 circuits in operation in the state.

At the workshop held on June 12, 2008, in Harrisburg, Verizon informed the Commission Staff and Liberty that as a result of the FCC Docket No. 07-38, Verizon expects that it will need to report broadband customers at various speeds on a national basis and therefore will need to develop systematic and automated processes to do so. Therefore, it might be able to apply this approach to its future biennial updates in Pennsylvania, although perhaps not for the next

[155] Response to Preliminary Finding #15.
[156] Response to Preliminary Finding #34.

biennial update, due in July 2009. Verizon believes that this approach could address the concerns that Liberty raised in Finding 1-5 and would obviate the need to adopt Recommendation 1-5. The Commission Staff reacted positively to Verizon's proposal and suggested that if Verizon is not able to use its new approach in time for the next biennial update, Liberty's recommended approach of using circuit counts would be an acceptable solution for the next biennial update. However, if actual broadband customer counts at various speeds are available, they should be used for subsequent biennial updates. Verizon and the Commission Staff agreed to continue discussions on this issue in order to achieve final agreement on the appropriate reporting of broadband usage in future biennial updates. Liberty believes that this approach provides a satisfactory resolution of Finding 1-5.

Finding 1-6: Verizon's method for determining broadband availability at 1.544 Mbps or greater does not accurately reflect actual broadband availability in Pennsylvania.

For NMP reporting purposes, VPA currently determines whether a loop is qualified for broadband service or for DSL service based on the length of the loop as shown in Verizon's Golden Source inventory database. VPA assumes that i) all copper access lines[157] less than or equal to 12 kft in length are capable of supporting DSL service at data speeds of 1.544 Mbps or greater and ii) all copper access lines greater than 12 kft in length are not capable of supporting DSL service at broadband speeds.[158] However, based on a field survey conducted by Verizon during 2003 using actual ADSL lines in-service across the entire Verizon footprint, these two critical assumptions are not always correct.[159]

The Pennsylvania portion of this field survey involved 1,051 existing ADSL lines served out of seven different central offices. Verizon selected the seven central offices for this survey because of the preponderance of the long loops served by these offices. The tests used a testing capability known as "Maximum Attainable Bit Rate" that is inherent to all DSLAM devices.[160] Verizon performs this test by having the DSLAM modem share test data with the customer's modem to determine the maximum data speeds available on the line being tested. The following table shows the results of Verizon's field survey in Pennsylvania:[161]

[157] These copper access lines consist of those loops served directly by the central office and those served from remote terminals.
[158] Response to Data Request #141. The only exceptions to this assumption are those lines located in central offices equipped with Celerity testing capabilities. When Celerity testing identifies a line greater than 12 kft that can support broadband data speeds based on the measured loss on the line, Verizon will update its Golden Source database with a "pseudo" loop length for that line to indicate that it is capable of supporting broadband service (see response to Data Request #227). According to its response to Data Request #118, VPA has Celerity testing capabilities in 88 of its central offices.
[159] Response to Data Request #121.
[160] DSLAMs are the equipment located in the central office or remote terminals that provide DSL service.
[161] Response to Data Request #121, and Interview #7, October 9, 2007.

Table 1-4

Summary of Verizon's Broadband Test Results for Pennsylvania DSL Lines Tested in 2003

Customers loop lengths up to:	Rolling Total of such loops tested	Number of Loops tested in each kft	Number of loops capable of supporting broadband data speeds	Percentage of loops capable of supporting broadband data speeds
12 kft	**(Begin Proprietary)**			
13 kft				
14 kft				
15 kft				
16 kft				
17 kft				
18 kft	[162]			**(End Proprietary)**

As demonstrated by the table above for those lines with loop lengths of 12 kft or less (*i.e.*, the classification of lines that VPA assumes are all capable of supporting broadband service in its biennial updates) **(Begin Proprietary) (End Proprietary)** percent were not capable of supporting broadband data speeds. On the other hand, of the **(Begin Proprietary) (End Proprietary)** lines that have loop lengths greater than 12 kft but less than 18 kft (*i.e.*, a classification of lines that Verizon assumes are not capable of supporting broadband service for NMP reporting purposes), **(Begin Proprietary) (End Proprietary)** were found to be capable of supporting DSL service at speeds of at least 1.544 Mbps.[163]

Laboratory testing results conducted by Verizon also support the results of these field studies on working ADSL lines. These laboratory tests revealed that environmental and physical factors of any given line will affect the data speeds that the line is capable of supporting. Such factors include number, length, and location of bridged taps, as well as gauge of the wire and the amount of noise impairment on the line. The lab tests revealed that, as the result of these factors, some loops less than 12 kft in length cannot support broadband data speeds and some loops greater than 12 kft can support broadband data speeds.[164]

[162] **(Begin Proprietary)**

(End Proprietary)

[163] Liberty calculated the total numbers in the 12 kft to 18 kft range by subtracting the total lines in the less than 12 kft range from the total lines (*e.g.*, 1045-663 =382 and 864-623 = 241)

[164] Response to Data Request #121 and Interview #7, October 9, 2007.

In addition, Liberty found that when recording the loop lengths in its Golden Source database, Verizon adds the length of any bridged taps on that line to the total length of the physical loop.[165] For example, for an 11-kft loop with a two-kft bridged tap, Verizon will inventory the loop in Golden Source as being 13 kft in length and therefore not qualified for broadband service.[166] However, factors other than the length of a bridged tap, such as the location of the bridge, will determine the effect that the bridged tap has on the loop. Simply adding the length of the bridged tap to the total length of the loop does not provide a good indicator of the effect the bridged tap will have on the data speeds the line is capable of supporting.[167]

By using flawed assumptions, based solely on loop length and incorporating the length of the bridged taps in the total loop length, to determine whether a line can support broadband data speeds, VPA does not provide the Commission with an accurate assessment of the percentage of its access lines available to support broadband service. In fact, the results of Verizon's testing indicate that VPA currently appears to be underreporting the actual broadband availability. Thus, for the Sixth VPA Biennial Update, using a more accurate measure of broadband qualification is unlikely to have affected whether VPA met its year-end 2006 broadband availability commitments. However, as Verizon's NMP broadband availability commitments become more stringent in the future, Verizon's current method for reporting its compliance in the biennial updates will not suffice. For example, in the extreme case when Verizon must meet a 100-percent availability commitment, Verizon cannot simply state that it has met this commitment by engineering 100 percent of its lines to be less than 12 kft. As demonstrated by Verizon's study, six percent of the lines in this loop-length category will not be capable of supporting broadband service unless Verizon redesigns these lines to make them capable of supporting broadband data speeds.

Verizon indicated that it disagreed that it should not be permitted to assume that all loops of 12 kft or less are capable of delivering broadband DSL services. Verizon based its disagreement on its interpretation of the Commission's September 17, 2003, Order at Docket No. P-00930715F0002 approving VPA's Third Supplement to its NMP following a litigated proceeding. Verizon interpreted the order to mean that the Commission accepted the "factual premise" that loops less than 12 kft from the central office or a DSL-equipped remote terminal are capable of download speeds of at least 1.544 Mbps based on expert testimony. Verizon indicated that it has based its deployment plans and reporting upon the Commission's determination that loops less than 12 kft are broadband capable and it would now be unfair, and a violation of Verizon's due process rights, to question that determination.[168]

[165] Response to Data Request #131.

[166] This is not a comprehensive list of the cases for which Verizon inventories loops in the Golden Source database with loop lengths that differ from their actual physical length. For lines located in central offices equipped with Celerity testing capabilities, when Celerity testing identifies a line greater than 12 kft that can support broadband data speeds based on the measured loss on the line, Verizon will update its Golden Source database with a "pseudo" loop length for that line to indicate that it is capable of supporting broadband service (see response to Data Request #227).

[167] Response to Data Request #214.

[168] Response to Preliminary Finding #12.

However, Commission Staff has informed Liberty that its response to Verizon's interpretation is that the Commission's September 17, 2003 Order at Docket No. P-00930715F0002 merely accepts the opinion of the witnesses in that proceeding that having a loop length of less than 12 kft is one of the criteria that must be in place if the loop is to be broadband capable. Nothing in the order mandated that Verizon use loop length as the sole basis for determining broadband availability. In fact, the order specifically requires Verizon to provide broadband services at speeds of at least 1.544 Mbps (the statutory definition of broadband), and still requires 100% broadband availability by 2015. According to both Verizon and Liberty's analyses, these requirements cannot be met by the 12-kft rule alone.

Regarding bridged taps, Verizon indicated that in some instances, accounting for about 18 percent of the entries in its Golden Source database, it adds the length of the bridged taps to the total loop length inventoried in Golden Source. Verizon noted that this practice may result in a loop of less than 12 kft appearing to be more than 12 kft and therefore VPA would not count this loop as capable of delivering DSL service at broadband data speeds. Verizon stated that it "makes this adjustment in a good faith attempt to account for the impact of bridge [sic] tap on the speed performance of the line."[169]

Recommendation 1-6: Implement a revised broadband availability identification process that more accurately represents Verizon's ability to support broadband DSL service in its network.

Despite Verizon's assertion that it bases its broadband availability reporting assumptions upon its interpretation of a Commission order, Liberty reiterates that these assumptions lead to erroneous results. As noted, although the error in relying solely on the loop length currently produces an underreporting of the overall broadband availability in VPA's serving area, the direction of the error may well change in the future. Liberty believes that VPA could use other methods to make a more accurate determination of broadband availability. As one possible alternative, VPA could deploy Celerity test equipment in each of its central offices. Such equipment would allow VPA to make a broadband determination based on the attenuation reading in a Celerity test of the line. VPA needs to investigate all possible options to determine the most cost-effective solution that will provide a more accurate assessment of a line's ability to support broadband data speeds than its current loop length based approach.

At the workshop held on June 12, 2008, in Harrisburg, Verizon and the Commission Staff agreed that tests of the actual capability of lines providing DSL service ("performance-based testing") be used to adjust reported broadband availability in future biennial updates to account for lines 12 to 18 kft in length that are capable of providing broadband service. In addition, Verizon and the Commission Staff agreed that Verizon would also initially adjust the broadband availability based on performance-based testing to account for the percentage of lines below 12 kft that do not qualify for broadband service. Verizon would modify this adjustment if it can substantiate its ability to provide these lines within commercially reasonable intervals (ten business days for 1.544 Mbps and above, and 60 days for 45 Mbps and above) after appropriate provisioning work

[169] Response to Preliminary Finding #16.

on the lines (*e.g.*, removing bridged taps or replacing existing pairs with spare pairs capable of providing broadband speeds). Liberty believes this agreement constitutes a satisfactory resolution of Finding 1-6.

Finding 1-7: VPA did not include all of its FiOS lines in the calculation of the percentage of broadband capable lines in its Sixth Biennial Update.

In its Sixth Biennial Update, VPA reported that because the effort to convert its data on the number of households passed by FiOS to an access lines equivalent is an intensive manual process it only included some of its FiOS facilities in the broadband availability count.[170] According to Verizon, it only undertook this manual effort in the ten rural central offices that had FiOS available in 2006.[171] These ten offices accounted for **(Begin Proprietary) (End Proprietary)** of the overall rural total of **(Begin Proprietary) (End Proprietary)** access lines qualified to provide broadband service at data speeds greater than 1.544 Mbps, which represents 62 percent of VPA's total rural access lines.[172] For the suburban and urban portions of the state, VPA indicated that at the end of 2006 it was able to meet the NMP 60 percent commitment using only its DSL broadband-qualified loops and therefore chose not to undertake the manual effort to include the FiOS lines installed in the suburban and urban exchanges in its reported results.[173]

The inclusion of the FiOS lines in suburban and urban areas of the state may only have a negligible impact on VPA's reported results as these lines often will simply replace the broadband capable copper facilities that it includes in the reported results. However, as VPA continues to expand its FiOS footprint, excluding the FiOS lines from the results calculation does not give the users of the NMP report an accurate indication of the actual percentage of VPA's broadband available access lines.

Verizon agreed that it did not include all of its FiOS lines in the Sixth VPA Biennial Update results, indicating that VPA did not need these lines in the calculation to achieve its 60 percent availability objective. Verizon indicated that including these lines in the calculation is a labor intensive manual process, and as a result, VPA chose to only include the FiOS lines in the rural areas of the state. Verizon stated that it anticipates having the required IT work complete by year-end 2008 to allow for the inclusion of all its FiOS lines in the next VPA biennial update scheduled to be filed in mid-2009.[174]

[170] VPA Sixth Biennial Update, p. 22.
[171] Response to Data Request #178.
[172] Responses to Data Requests #12 and #85.
[173] Response to Data Request #85.
[174] Response to Preliminary Finding #9.

Recommendation 1-7: Implement the systems development necessary to include all of its FiOS lines in future biennial updates.

By excluding FiOS, a growing product, from its broadband availability calculation, VPA does not provide a complete picture of its broadband availability in Pennsylvania. This product needs to be fully accounted for in future biennial updates.

Finding 1-8: VPA's methods for converting FiOS facilities to access line quantities and for reporting rural DSL availability in the Sixth Biennial Update may distort VPA's reported broadband availability.

In its Sixth Biennial Update, VPA represented its broadband availability by reporting the percentage of its Pennsylvania access lines available for broadband service within ten business days of a customer's request. To calculate this percentage Verizon includes in the numerator the following categories of access lines:[175]

- Total copper loops that are less than or equal to 12 kft and are not served from a remote terminal.
- Total loops served by remote terminals using PARTS DSL technology.
- Total loops served by remote terminals using Overlay DSL technology.
- Working telephone numbers on FiOS lines in FiOS Greenfield applications.[176]
- Working telephone numbers on FiOS lines in areas that also have copper facilities where Verizon has manually removed the copper facilities that are broadband capable from the calculation to prevent double counting.[177]

The denominator for this calculation is VPA's total in-service access lines in the state and the total of FiOS working telephone numbers.[178]

The first three categories of access lines listed above that Verizon uses in the numerator are specific copper loop facilities terminating at the customer's premises. For example, if a customer has three lines in service using this loop technology, the customer will have three distinct access lines physically terminating at his or her home and Verizon counts all three of these lines toward the availability calculation. However, for the two categories of FiOS lines included in the numerator, Verizon uses the sum of the telephone numbers served by the FiOS lines as a surrogate for the number of physical access lines. By way of example, if a household using FiOS service has three telephone numbers on their FiOS line, Verizon will count that single FiOS line

[175] Responses to Data Requests #12 and #180, and Interview #3, September 25, 2007.
[176] Verizon defines a FiOS Greenfield application as one on which no copper facilities exist to deliver telecommunications services to the residences and businesses in the "Greenfield" area.
[177] For its Sixth Biennial Update, VPA only did this in the rural areas of the state.
[178] Response to Data Request #12, and Interview #3, September 25, 2007.

terminating at the customer's premises as three unique access lines in the numerator and denominator of the broadband availability calculation.[179]

All FiOS lines are, by default of the technology used, broadband capable. By counting working telephone numbers on these lines as actual access lines in the broadband availability calculation, VPA is distorting its actual availability statistics for those customer premises that do not have FiOS as a service option and must rely on VPA's copper facilities. To illustrate this on a micro scale, assume a service area of 10,000 customer access lines was served exclusively with copper facilities with 6,000 of the 10,000 lines measuring less than 12 kft in length. In this hypothetical scenario, VPA's broadband availability would be 60 percent (6,000 divided by 10,000). Next assume the same scenario, but with 1,000 of the 6,000 lines being served by FiOS facilities with each FiOS customer having two working telephone numbers. In this scenario Verizon's broadband calculation would result in 63.3 percent broadband availability; that is a numerator of 7,000 [*i.e.,* 5,000 copper lines less than 12 kft plus 1,000 FiOS lines multiplied by two telephone numbers] and a denominator of 11, 000 (*i.e.,* 9,000 copper access lines plus the 2,000 FiOS telephone numbers).

As illustrated by this example, VPA's reported broadband availability would have increased by 3.3 percent; however, the actual broadband availability for the 4,000 customer premises served exclusively by the cooper lines that exceed 12 kft did not improve at all. It is important to note that Liberty is using this example for illustrative purposes only. In this illustration, the percentage change in broadband availability went in VPA's favor. However, it is also very possible that when VPA includes its urban and suburban FiOS facilities in this calculation the percentage change in broadband availability can decline.[180] Using a combination of copper access lines and FiOS working telephone numbers to calculate broadband availability, VPA does not provide a reliable indication of the percentage of residential and business premises that have broadband service available to them.

Verizon disagreed with Liberty and contended that counting each working telephone number as an access line is an appropriate method for calculating its broadband percentages. Verizon indicated that the VPA biennial update is based on access lines that have broadband service available to them and VPA defines access lines as working telephone numbers. Verizon believes that its method for calculating broadband availability is being consistently applied without regard to the facilities VPA uses to provision the broadband service [181]

A similar situation occurs with the VPA reporting of rural DSL availability. In the Third Supplement to its NMP, VPA committed to deploy DSL at any speed to 45 percent of its rural *access lines* by year-end 2006 with an availability gap between businesses and residences not to exceed 10 percent. On page 4 of the Sixth Biennial Update, VPA listed a table showing that

[179] In its response to Data Request #181, Verizon indicated that a single FiOS line is capable of supporting up to 16 telephone numbers.
[180] In its response to Data Request #178, VPA indicated that it only considered the FiOS lines in the rural areas of the state in its Sixth Biennial Update, but that it is looking into a method for including all of its FiOS lines in future Biennial Updates.
[181] Response to Preliminary Finding #18.

(Begin Proprietary) **(End Proprietary)** percent of rural residence, **(Begin Proprietary)** **(End Proprietary)** percent of rural business, and **(Begin Proprietary)** **(End Proprietary)** percent of the rural residence and business combined have DSL availability.[182] Verizon based these percentages on households and not on access lines because residential and business classification data is available by address (household) not by access line.[183] However, Verizon provides no indication on this table that it based these percentages on rural households and not on access lines.[184] Additionally, page 10 of the Sixth Biennial Update contains a different table stating the percentage of access lines available for DSL service for each of the three exchange classifications (urban, suburban, and rural). This table indicates that **(Begin Proprietary)** **(End Proprietary)** percent of the rural *access lines* are available for DSL service. Because the **(Begin Proprietary)** **(End Proprietary)** percent reported for DSL access line availability agreed with the overall percentage reported on the table reflecting the availability for rural residences and businesses, the reader of the report could be lead to believe that Verizon used access lines as the standard for reporting its progress toward meeting this commitment, when in fact Verizon used households.[185] Verizon's method for reporting its DSL availability in the rural areas of Pennsylvania using different component data may provide misleading results to the users of the biennial updates.

Verizon noted that it based these percentages on households and not on access lines because it has residential and business classification data inventoried by address (household) and not by access line. Verizon indicated that all other DSL and broadband percentages reported in the VPA Sixth Biennial Update are based on access lines.[186] Verizon indicated that for future biennial updates it will clearly state whether any given metric was provided using access lines or households to avoid confusion.[187]

Recommendation 1-8: Use a universal standard unit for calculating VPA's broadband availability percentage in future biennial updates.

Given the different technologies Verizon currently uses and other technologies that it may use to meet future broadband availability commitments, it is important to have a uniform unit of measure of broadband availability that is consistent across the different technologies. The reporting should be supplemented by reporting availability by each technology type (*e.g.*, DSL, FTTP, etc.). A common standard unit for reporting broadband availability, such as households[188] where VPA has made broadband available (households passed), will eliminate the confusion and errors caused by converting different technologies into the current access line standard. Liberty

[182] In its response to Data Request #243, VPA stated that it misreported the **(Begin Proprietary)** **(End Proprietary)** percent shown on this table, and the percentage reported should have been **(Begin Proprietary)** **(End Proprietary)** percent.
[183] Response to Data Request #183.
[184] Responses to Data Requests #183, #243, and #244.
[185] In its response to Data Request #222, Verizon stated that it misreported the **(Begin Proprietary)** **(End Proprietary)** percent, and the correct percentage for rural access lines available for DSL service is **(Begin Proprietary)** **(End Proprietary)** percent.
[186] Response to Data Request #183.
[187] Response to Preliminary Finding #21.
[188] Liberty uses "households" as a generic term to include all residential and business locations served by VPA.

does not agree with Verizon that equating a working telephone number to an access line is appropriate method to account for its FiOS facilities. As explained in its finding, this method of conversion gives more weight to VPA's FiOS facilities by the fact that one FiOS line can support many telephone numbers. This overweighing will ultimately distort VPA's percentage of broadband availability at 1.544 Mbps and greater as it continues to expand its FiOS footprint in Pennsylvania.

Finding 1-9: VPA's results for broadband availability in its Sixth Biennial Update include lines that are not readily available for broadband service.

While working to replicate VPA's reported percentage of rural, suburban, urban, and total access lines that have broadband availability at data speeds of 1.544 Mbps or greater, Liberty examined Verizon's rules for identifying a line as qualified for reporting purposes. Liberty does not agree with one of these rules. Specifically, Verizon counted **(Begin Proprietary) (End Proprietary)** lines as qualified that its Golden Source database list as not qualified with a reason of "PARTS SUSPEND." Verizon uses this code to identify lines not qualified due to a capacity relief job in progress. Verizon contends that lines with a "PARTS SUSPEND" code should be considered qualified, because once the relief job is complete, the "PARTS SUSPEND" status would be removed from the affected lines.[189] However, Liberty notes that until VPA completes such relief jobs, the customers served by these lines are denied DSL service, and therefore Verizon prematurely counted these lines as qualified for broadband service in its NMP reporting.

Verizon noted that while it is VPA's policy to provide DSL facility relief jobs prior to exhaust, on occasion DSL customer demand outpaces remaining capacity. When this occurs, Verizon's ordering systems temporarily prevent the ordering of DSL service until the relief job can be completed. [190] Verizon contended that the inability for a small number of customers in DSL-capable areas to obtain DSL service when the line is designated as "PARTS SUSPEND" in Golden Source is only a temporary condition and therefore these lines should be counted as broadband available.[191]

Recommendation 1-9: Include only lines readily available to support broadband service in the numerator of the percentage availability calculation.

By including lines with a "PARTS SUSPEND" status, VPA overstates the percentage of lines that are actually available to support this service. Exclusion of such lines would reduce the broadband availability in suburban areas reported in the VPA Sixth Biennial Update by one percentage point, but would have a negligible impact on the other reported percentages. However, it is important for Verizon to count only lines currently capable of providing broadband service.

[189] Response to Preliminary Finding #23.
[190] Response to Preliminary Finding #31.
[191] Response to Preliminary Finding #37.

Liberty takes a literal interpretation of the meaning of "available" and does not agree with VPA's contention that because a relief job is only a temporary condition, lines with this condition should be included in the availability calculation. VPA should not consider lines available for broadband service unless VPA is prepared to immediately accept and provision a request for broadband service from the customer serviced by that line. Customers who have lines awaiting relief jobs do not have broadband service available to them until VPA has completed that relief job.

Finding 1-10: Information provided by Verizon's Golden Source database is not consistent with information provided by Verizon's online website.

Verizon has a website that customers may use to determine the availability of broadband services for a telephone number. VPA uses its Golden Source database to report broadband availability in its biennial updates.[192] Liberty selected a random sample of 65 telephone numbers for each of three categories of broadband, as inventoried by Verizon, to assess the consistency of Verizon's responses to customers' online queries with Verizon's Golden Source database. The inventory categories are i) FiOS, ii) overlay, and iii) other broadband service options (*i.e.*, central-office based and PARTS DSL).

Liberty questioned Verizon about each instance for which Verizon's website showed that a line did not have broadband available but Golden Source showed that the line did. Initially Verizon indicated that many of its lines had been disconnected since year-end 2006 (the date of the Golden Source data initially received by Liberty). Therefore, Liberty pulled new samples of 65 lines each for overlay and other broadband service options using a newly updated Golden Source database.[193]

Using the responses to data requests, Liberty estimated the percentage of each type of line for which there existed a discrepancy in the broadband availability between Golden Source and Verizon's website.[194] The following table summarizes the results of this analysis.

[192] Response to Data Request #56.
[193] Response to Data Request #295.
[194] Responses to Data Requests #294 and #323.

Table 1-5

Summary of Analysis Estimating the Percentage of Discrepancies in Broadband Availability Results Between Golden Source and Verizon's Website

	Population Size with Broadband	Liberty Sample Size	Website and Golden Source Consistent	Non-working Lines or Non-Verizon Lines	Website and Golden Source Inconsistent	Percent of Lines Inconsistent
FiOS	**(Begin Proprietary)**	**65**	**61**	**4**	**0**	**0%**
Overlay Sample 1		65	51	3	11	17%
Overlay Sample 2		65	51	0	14	22%
Subtotal Overlay		**130**	**102**	**3**	**25**	**19%**
Other Broadband Sample 1		65	49	15	1	2%
Other Broadband Sample 2	**(End Proprietary)**	65	61	3	1	2%
Subtotal Other Broadband		**130**	**110**	**18**	**2**	**2%**

In summary, Verizon's website provides information inconsistent with its Golden Source database for about 19 percent of its overlay lines and for about two percent of its other broadband (central-office based and PARTS DSL) lines. Given the populations of these types of lines in Pennsylvania, this implies that such inconsistency applies to approximately **(Begin Proprietary) (End Proprietary)** overlay and **(Begin Proprietary) (End Proprietary)** other broadband lines.

In response to Liberty's observation of these discrepancies, Verizon noted that Golden Source is not the final determinant of whether a line is qualified for broadband or non-broadband DSL, but "is the source of the loop makeup information which confirms that [a line] resides in a DSL qualified area."[195] The website qualification process involves an additional step. When Verizon receives a query from one of its customers using Verizon's web-based tool to determine whether DSL service is available to the customer, Verizon queries its Loop Qualification Processor (LQP) database to make this determination and return a response to the customer's inquiry.

[195] Response to Preliminary Finding #38.

Verizon explained that in addition to Golden Source, LQP receives input from other data sources that allow it to make a DSL availability determination based on factors other than the length of the customer's line. These additional factors include the availability of a DSL equipment port in the central office and the availability of internet backbone capacity. As a result, Verizon can identify a line as available for DSL in its biennial update, but, because of other factors identified by Verizon's LQP database and not available in Golden Source, Verizon will not provision DSL service on that line.[196]

Therefore, Liberty notes that by basing DSL availability for NMP reporting purposes simply on the length of the customer's line as inventoried in Golden Source, Verizon does not take into account other factors that may prevent customers from receiving DSL service. This may result in an overstatement by VPA of its actual DSL and broadband availability results in its biennial updates.

Verizon disagreed with this conclusion, indicating that it provisions DSL to a specific geographic area through the deployment of DSL equipment. VPA sizes this equipment deployment to meet a forecasted demand for the area. Upon completion, all the access lines in this service area are modified to reflect DSL capability in Golden Source. However, as customers order the service, spare DSL equipment available for new service will begin to decline. While it is VPA's policy to provide DSL facility relief jobs prior to exhaust, on occasion, DSL customer demand outpaces remaining capacity. When this occurs, VPA's databases temporarily prevent the ordering of DSL service until the relief job can be completed, as noted in Finding 1-9. [197]

Recommendation 1-10: Use consistent data sources for reporting broadband availability in the biennial updates and for reporting broadband availability on Verizon's website, including only lines that are readily available for the provision of broadband service.

If Verizon's ordering systems and website indicate that a line in not available for broadband service, it is inconsistent for VPA to include such lines in its broadband availability calculations. As noted in Finding 1-9 and Recommendation 1-9, when Verizon's systems temporarily prevent the ordering of DSL service until the relief job can be completed, then DSL service is not available to those customers who wish to order it. Thus, until it completes the relief job, VPA should not be considering these lines as available for DSL service.

Finding 1-11: Verizon is not consistent in its treatment of orders delayed due to customer-caused reasons when reporting the percentage of access lines available for broadband service within ten business days at data speeds of 1.544 Mbps or greater.

In its Sixth Biennial Update, VPA reported that, for 2005, the average installation interval for all broadband services with downstream speeds of at least 1.544 Mbps was **(Begin Proprietary)**

[196] Interview #17, January 21, 2008 and response to Data Request #312.
[197] Response to Preliminary Finding #31.

(End Proprietary) business days, measured from the time Verizon received the customer's request for service to the time Verizon provisioned the service. For 2006, Verizon reported an average interval for those same orders of **(Begin Proprietary) (End Proprietary)** business days.[198] To calculate this average interval for broadband service installation, Verizon includes its provisioning results for broadband DSL orders, DS-1 orders, and FiOS orders.[199] However, with the exception of FiOS orders, Verizon does not exclude from the calculation any orders that have been delayed due to customer-caused reasons (*e.g.*, orders delayed due to customer not ready for service on the due date, no access to the customer's premises, etc.).

Verizon indicated that it has no way to identify DSL orders delayed due to customer reasons, and therefore includes those orders in its interval results calculation.[200] For DS-1 orders, Verizon indicated that even though it has a Missed Function Code indicator that identifies orders delayed due to a customer-caused reason, it does not exclude those orders from its provisioning results calculation.[201] However, for the FiOS service orders, Verizon excludes those orders that contained a Missed Appointment Code indicating that the provisioning delay was due to a customer-caused reason.[202]

To provide a meaningful average installation interval, the component data should be treated on a consistent basis. Verizon's current method for handling orders missed due to customer reasons is both inconsistent and potentially misleading to the users of the biennial updates.

Verizon agreed that it excludes FiOS orders, but not DSL or DS-1 orders, delayed for customer reasons from its calculation of average interval for provisioning broadband services. Verizon stated that by not excluding these orders, it skews the reported results against Verizon.[203]

Recommendation 1-11: Exclude all orders that were delayed for customer-caused reasons from the performance calculation.

Verizon should be consistent in how it treats the exclusion for customer caused delays by excluding all of these orders from its results calculation.

Finding 1-12: Liberty was unable to replicate VPA's reported results for broadband and rural DSL availability in is Sixth Biennial Update.

On page 3 of its Sixth Biennial Update, VPA reported that 62 percent of Rural, 63 percent of Suburban, 81 percent of Urban, and 68 percent of all access lines have broadband availability at

[198] See Finding 1-3 regarding the use of provisioning interval averages to report on Verizon's progress toward meeting this requirement.
[199] See Finding 1-7 regarding VPA's inclusion of FiOS lines in only the rural areas of the state in its broadband availability calculation.
[200] Response to Data Request #157.
[201] Response to Data Request #159. VPA also does not exclude customer-caused misses from its calculation for the 45 Mbps and greater interval results reported in the Biennial Updates.
[202] Response to Data Request #158.
[203] Response to Preliminary Finding #10.

data speeds of 1.544 Mbps or greater. Using Verizon's data, Liberty calculated availability of 62 percent, 61 percent, 80 percent, and 66 percent, for Rural, Suburban, Urban, and total availability, respectively.[204]

In its attempt to replicate the Broadband availability figures, Liberty began with the raw data files provided by Verizon.[205] When Liberty could not initially match VPA's results, Liberty detailed its replication process for Verizon, which relied on using the area code and exchange (NPA/NXX) to determine the serving central office. In response, Verizon stated that due to local number portability, the office designation (Rural/Urban/Suburban) should be determined by central office CLLI code rather than by area code and exchange,[206] and Liberty concurs with Verizon's rationale. In addition, Verizon stated that duplicate working telephone numbers (WTNs) should be kept in the calculation to account for situations in which customers have the same telephone number working at multiple locations;[207] Liberty determined that this situation applied to less than 1,000 out of the total 4,483,004 lines.

After applying the changes suggested by Verizon, Liberty's calculated broadband availability was as follows:

Table 1-6

Summary of Liberty's Broadband Availability Replication Results

Liberty Calculation Results				
	Rural	**Suburban**	**Urban**	**Total***
Liberty Re-calculation: Number of Lines with Broadband Available	**(Begin Proprietary)**			
Liberty Re-calculation: Number of Lines without Broadband Available				
Liberty Re-calculation: Total Lines				
Liberty Re-Calculation: Percent of Lines with Broadband Available				
Verizon NMP Reported Numbers-Percent Broadband Availability				**(End Proprietary)**
*Totals include 1,171 lines where the CLLI code did not have a Rural/Urban/Suburban designation.				

Liberty's analysis showed that Verizon's broadband availability is lower than it reports in the VPA biennial updates.

[204] Response to Data Request #56.
[205] Response to Data Request #56.
[206] Response to Data Request #219.
[207] Response to Data Request #219.

In response, Verizon provided Liberty with a number of possible reasons why Liberty's calculated results did not exactly match Verizon's reported results.[208] However, none of these reasons fully accounted for the differences. Each time Liberty attempted to recalculate the results based on VPA's input, Liberty found it still could not duplicate VPA's reported results.

Liberty had similar difficulty attempting to replicate VPA's reported DSL availability. On page 4 of its Sixth Biennial Update, VPA states that **(Begin Proprietary) (End Proprietary)** percent of Rural Residence, **(Begin Proprietary) (End Proprietary)** percent of Rural Business, and **(Begin Proprietary) (End Proprietary)** percent of the combined Rural Residence and Business customers have DSL availability. Verizon subsequently acknowledged an error in its reporting of the overall result of **(Begin Proprietary) (End Proprietary)** percent, and indicated that the correct figure for overall rural DSL availability is **(Begin Proprietary) (End Proprietary)** percent.[209] Liberty verified this revised overall result using the data provided by Verizon.[210]

Liberty used Verizon's data on rural DSL availability for each customer location[211] to replicate the percentage of DSL availability for business and residence customers.[212] The table below shows these results.

Table 1-7

Summary of Liberty's Rural DSL Availability Replication Results

Liberty Replication Results - Rural DSL Availability			
	Business	***Residence***	***Combined***
DSL Qualified	**(Begin Proprietary)**		
Not DSL Qualified			
Total			
Percent DSL Qualified			**(End Proprietary)**

As the table illustrates, VPA has understated its rural business and residence DSL availability by location, *i.e.*, **(Begin Proprietary) (End Proprietary)** percent actual versus **(Begin Proprietary) (End Proprietary)** percent reported for business and **(Begin Proprietary) (End Proprietary)** percent actual versus **(Begin Proprietary) (End Proprietary)** percent reported for residence.

[208] Response to Preliminary Finding #23.
[209] Response to Data Request #243.
[210] Response to Data Request #56.
[211] Responses to Data Requests #56, #57, and #218.
[212] According to the responses to Data Requests #222 and #243, VPA uses household addresses, not access lines, to calculate rural DSL availability by business and residence class of service.

Because Liberty could not produce VPA's reported results, it requested further clarification of VPA's process for calculating these results. Verizon stated that "if a particular record is not recorded with a '01' or a '05' it is assumed to be residential."[213] Because Liberty still could not replicate VPA's results, Liberty requested further clarification.[214] Verizon stated that, in fact, it considers codes '01' and '99' to be residential and only code '05' to be business.[215] Still unable to arrive at the results reported by VPA, Liberty requested further explanation of Verizon's calculations, and although Liberty attempted to address all the items that Verizon raised as possible explanations for the discrepancies, Verizon's response did not sufficiently explain the differences between Liberty's and Verizon's results.[216]

Finally, after review of the data used by Liberty, Verizon stated that when VPA reported its results in the Sixth Biennial Update it inadvertently used data from November 2006 and not December 2006, and that VPA's percentages now match Liberty's calculated results for rural DSL availability when VPA uses the correct month.[217]

Recommendation 1-12: Clearly document the process used to calculate the broadband availability percentages reported in the biennial updates to provide a clear audit trail to support the results.

Liberty's difficulties replicating VPA's reported results, as well as VPA's acknowledged reporting errors,[218] clearly identified a gap in VPA's documented process for calculating and reporting its results. The documented process should include a detailed description of the lines included in both the numerator and the denominator of this calculation and VPA's process for identifying these lines. Such documentation would serve to support both VPA's internal reporting quality and to facilitate future internal and external audits of the reported results. Additionally, the lack of quality found in this and many other VPA reported results highlights the need for the development of internal quality controls that would be used by VPA to verify the accuracy of its reported results before future biennial updates.

Finding 1-13: The DSL customer count data provided by Verizon in its biennial updates does not appear to provide information useful for determining the number of in-service DSL lines or the growth of DSL service in Pennsylvania.

In the "DSL Service" section of its Sixth Biennial Update, VPA reported that its DSL customers in Pennsylvania are ISPs and CPs, and that the residential and business end users who purchase DSL service are the customers of the ISPs and CPs. As such, VPA indicates that it is unable to

[213] Response to Data Request #218.
[214] Data Request #282.
[215] Response to Data Request #282 which conflicted with the response to Data Request #218.
[216] Response to Data Request #284 and response to Preliminary Finding #22.
[217] Response to Preliminary Finding #22.
[218] See Finding 1-4 for details on these reporting errors.

provide customer count data, service speed, or residential/business breakdowns for any ISP/CP using its DSL lines because it does not have access to the individual ISP/CP company proprietary customer records or service data. In lieu of providing detailed information on the DSL lines VPA sells to its ISP/CP customers in its NMP updates, VPA simply provides the total number of ISP/CP customers to which it sells DSL.[219]

In the Fourth Biennial Update, in addition to the number of ISP and CP customers it serves, VPA provided data on the number of in-service DSL lines it provided these ISP/CP customers in each of the three exchange classifications (rural, suburban, and urban), as well as information that allowed users of the NMP to see the growth of DSL lines in service over a four year period from 1999 to 2003.[220] In the Fifth Biennial Update, VPA provided the same information; however, it only listed the statewide total level of in-service DSL lines without disaggregating this total by the three exchange classifications.[221] Verizon indicated that it did not provide similar information on in-service DSL lines in the Sixth Biennial Update because it is not required to provide this information based on its interpretation of the Chapter 30 reporting requirements, Act 183, or any Commission order.[222]

When asked why it did not supply the in-service DSL lines data as it had in previous VPA biennial updates, Verizon replied that the biennial updates reporting requirement calls for broadband customer counts. Verizon stated that it is unable to provide DSL end-user customer counts because it does not have the end-user customer records for the DSL lines it sells to the ISPs. Verizon added that at year-end 2006, it had **(Begin Proprietary) (End Proprietary)** in-service DSL lines in Pennsylvania.[223]

Item 1 of the Commission's NMP Reporting Guidelines states that the biennial updates "should provide specific information on how many *customers* are buying broadband services."[224] By providing information on the number of ISPs and CPs that purchase DSL service from VPA, Verizon appears to technically comply with the NMP reporting guidelines and gives the users of the NMP report a gauge of the number of ISPs and CPs operating in the state. However, Verizon does not give any indication of the actual number of in-service DSL lines or the growth of DSL service in Pennsylvania. For example, if VPA reports that fewer ISPs are purchasing its DSL service in 2008 than in 2006, this does not necessarily indicate that there has been a reduction in in-service DSL lines.

In response to Liberty's comments, Verizon agreed that its reported ISP customer count does not appear to provide information useful for determining the number of in-service DSL lines or growth in DSL service in Pennsylvania.[225] Verizon reiterated that it does not currently report

[219] VPA Sixth Biennial Update, p. 11.
[220] VPA Fourth Biennial Update, p. 12.
[221] VPA Fifth Biennial Update, p. 10.
[222] Response to Data Request #195.
[223] Response to Data Request #96.
[224] Chapter 30 Biennial Update Reporting Guidelines for Local Exchange Carriers [emphasis added].
[225] Response to Preliminary Finding #13.

DSL lines in-service because, in its opinion, it is not a reporting requirement of Chapter 30, Act 183, or any Commission order.[226]

> **Recommendation 1-13: Report the number of DSL lines in service at the end of the reporting period disaggregated by each of the three exchange classifications in addition to (or in lieu of) reporting the number of internet service providers and content providers in future biennial updates. Also report the number of DSL lines in service at the end of the reporting period for the past two biennial updates to provide the information needed to determine the growth rate for DSL service.**

Liberty believes that reporting the number of DSL lines in service at the end of the current reporting period as well as the number of lines in service at the end of the past two reporting periods would provide a more accurate view of the purchase of DSL service by customers in VPA's service territory and the growth in such purchases than simply reporting the number of ISPs and CPs.

> **Finding 1-14: VPA's reported results for broadband availability in or adjacent to the nearest right-of-way for public schools, healthcare facilities, and industrial parks in its Sixth Biennial Update do not accurately represent VPA's actual progress.**

VPA reported that 100 percent of public schools have broadband accessibility in or adjacent to the nearest right-of-way as of year-ends 2000 and 2005,[227] but Liberty found that VPA's actual broadband accessibility was less than 100 percent. Verizon provided Liberty with the list of public schools that it used to determine whether it had met this requirement.[228] This list contained 2,285 schools.[229] The Pennsylvania Department of Education provided Liberty with a list of public schools that could be used for comparison. This list contained 3,255 schools. Liberty also obtained an independent list from a school listing service that contained 3,234 schools.

Liberty used its independent list to match with the Verizon list, first attempting to remove all schools that were not part of former Verizon BA footprint based on the NPA and NXX combinations of the school's telephone number. As a result of this merge, Liberty found 205 schools that did not appear on Verizon's list.[230] Liberty provided this list of missing schools to

[226] Response to Preliminary Finding #8.
[227] VPA Sixth Biennial Update, pp. 6-7.
[228] Response to Data Request #10.
[229] In its response to Data Request #206, VPA stated that it had created this list in 1993 without the benefit of the internet. VPA did not explain why it had not updated this list for its 2007 (or earlier) reports. The list of public schools is not confidential information, and is publicly available.
[230] Liberty performed this merge very liberally, in the sense that it included as matching any school with a first word the same as one of the schools in VPA's list, and then further culled the mismatches by hand. Liberty took this approach because VPA's list did not include the address, telephone number, zip code, or other identifying information for the schools beyond name and central office.

Verizon and inquired why these schools did not appear on its list and whether Verizon met its obligation to have fiber facilities in or adjacent to the nearest right-of-way for these 205 schools.

Verizon responded that, of the 205 schools identified by the sample provided by Liberty, Verizon found 59 on its master list. Of the remaining 146, Verizon provided evidence[231] that 105 have fiber "available" to them,[232] and that the following 18 can be excluded from that analysis because:

- Thirteen were outside the Verizon PA service territory.
- One is a school located in Pennsylvania but belongs to a school district based in Ohio.
- Four locations were no longer in use as public schools.

This leaves 23 locations without facilities "available" to the nearest right-of-way, including:

- Eleven that Verizon concurs do not have fiber available as required by the NMP.
- Two that went into service after December 31, 2005 (and thus Verizon does not consider them part of the requirement).
- Nine that have fiber available in the adjacent right-of-way, but would require a small build achievable within ten business days.
- One that has fiber available to a point in the outside plant distribution network where broadband facilities would be extended to the school upon receipt of a service request.[233]

Liberty concludes that, of the facilities still in use in the VPA service area that were checked by Verizon, 18 percent (23 of 128) did not have fiber that is actually available in the nearest right-of-way.

Verizon indicated that it agrees that Liberty identified a "small number of schools constructed on or before December 31, 2005, that do not have Verizon fiber placed in the vicinity of the location." Verizon stated that it plans to assure broadband facilities are adjacent to the right-of-way abutting the locations identified by Liberty and it will have these facilities in place by the middle of 2008.[234]

VPA also reported that 100 percent of health care facilities have broadband facilities in or adjacent to the nearest right-of-way as of year-ends 2000 and 2005,[235] but Liberty found that VPA's actual broadband facility availability was less than 100 percent. Verizon provided Liberty with the list of health care facilities that it used to determine whether it had met this

[231] Responses to Data Requests #206 and #290. See also Finding 1-15 regarding the post-2005 compliance issue.
[232] In 15 of these 105 cases an additional 250 to 2,800 feet of fiber was needed to be extended in order to be available to the school in question.
[233] Responses to Data Requests #206 and #290. See also Finding 1-15 regarding the post 2005 compliance issue.
[234] Response to Preliminary Finding #17.
[235] VPA Sixth Biennial Update, pp. 6-7.

requirement.[236] This list contained 975 health care facilities.[237] Liberty obtained lists of 252 hospitals and 729 skilled nursing facilities (a total of 981 facilities).[238] Liberty's list did not include other qualifying health care centers as found in Verizon's response to Data Request 10.[239]

Liberty matched its lists with Verizon's list of hospitals and skilled nursing facilities. As a result of this merge, Liberty found that 247 of the 981 facilities on Liberty's lists did not appear on Verizon's list. Liberty provided a subset of this list that included 95 of the facilities not found, and asked Verizon why these facilities did not appear on its list and whether Verizon had met its obligation to have fiber facilities in or adjacent to the nearest right-of-way for these facilities.[240]

Verizon stated that of the 95 facilities that Liberty could not locate on Verizon's list, 13 did, in fact, appear on Verizon's list and 82 did not. Of these 82:[241]

- 4 did not have fiber available.
- 52 facilities had fiber either available or available within 1,000 feet of the health care facility.
- 20 facilities did not have fiber at the facility, but instead had fiber 1,000 or more feet away.[242]
- 4 facilities had fibers allocated for FTTP service in the area, but not "business as usual" fiber.[243]
- 2 facilities were no longer in use as health care facilities.

Thus, of the facilities still in use and checked by Verizon, 34 percent (28 of the 82) of the facilities did not have fiber available within 1,000 feet of the health care facility.

In response, Verizon did not agree with Liberty's assessment that its Sixth Biennial Update does not accurately represent Verizon's actual progress toward meeting this NMP commitment of fiber availability to 100 percent of the health care facilities. Verizon indicated that it will have fiber facilities installed to the health care facilities identified by Liberty in this finding by year-end 2008.[244]

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[236] Response to Data Request #10.
[237] In its response to Data Request #265, VPA stated that it had created this list in 1993 without the benefit of the Internet. VPA did not explain why it had not fully updated this list for its 2007 (or earlier) reports.
[238] Liberty used a list of nursing homes compiled by the Pennsylvania Department of Health, and obtained the list of hospitals from data-lists.com.
[239] According to the definition in the response, these other facilities were "kidney disease treatment centers including free-standing hemodialysis units, intermediate care facilities and ambulatory surgical facilities."
[240] Data Request #265. For two of these four, VPA did not indicate the distance of the nearest fiber. For the other two, VPA indicated they were 4,300 and 6,100 feet.
[241] Response to Data Request #265.
[242] When addresses of the fiber were given, Liberty verified distances using mapping software.
[243] In its response to Data Request #265, VPA refers to the fiber facilities that it has deployed for services other than FTTP as "business as usual" fiber.
[244] Response to Preliminary Finding #27.

Finally, VPA also reported that 100 percent of industrial parks have broadband accessibility in or adjacent to the nearest right-of-way as of year-ends 2000 and 2005,[245] but Liberty found that VPA's actual broadband accessibility was less than 100 percent. Verizon provided Liberty with the list of industrial parks that it used to determine whether it had met this requirement.[246] This list contained 501 industrial park locations. Liberty compiled a much more limited list of 187 industrial parks that advertised on the internet.

Liberty used its list to match with the Verizon list. Liberty could not find 28 locations from its list on Verizon's list.[247] Liberty sent this list to Verizon to confirm whether the missing industrial parks did, in fact, appear on Verizon's list, and also to determine whether fiber was available for those locations. Verizon responded that nine were on its list and had fiber, four were not on its list and had fiber available,[248] one was not on its list and did not have fiber available, and 14 should not have been on the list.[249] Thus, of the five items checked by Verizon that were not on its master list and were valid industrial park facilities, one (20 percent) did not have fiber available and a second had fiber 500 feet away.

In response, Verizon stated that it did not agree with Liberty's assessment that its Sixth Biennial Update does not accurately represent Verizon's actual progress toward meeting this NMP commitment of fiber availability to 100 percent of the industrial parks. Verizon indicated that it will have fiber installed to the missing location identified by Liberty by year-end 2008.[250]

Combining the results for schools, health care facilities, and industrial parks, Liberty found that of all the schools, health care facilities, and industrial parks not on Verizon's master list when checked by Verizon, 52 of 215 (24.2 percent) did not have fiber available.

> **Recommendation 1-14: Propose a definition of the requirements of the NMP commitment to have broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks and obtain agreement on this definition from the Commission Staff.**

The exact requirements of this NMP commitment and the requirements of "in or adjacent to" are not clearly defined. VPA needs to verify that it is meeting the spirit of this commitment based on its fiber deployment initiatives. VPA also needs to determine its future obligations with respect to this commitment.

[245] VPA Sixth Biennial Update, pp. 6-7.
[246] Response to Data Request #10.
[247] Liberty sent a list of 34 items in Data Request #266 and determined, based on VPA's response that some industrial parks appeared multiple times in VPA's list.
[248] Response to Data Request #266. Of the nine that it listed as having fiber available, VPA showed one as having fiber 500 feet away. It is not clear whether this distance would fall under the definition of having fiber "at or adjacent" to the facility. VPA identified five items as undeveloped land.
[249] Of the 14 that it identified as not appropriate for the industrial park list, VPA showed seven as individual properties, four as undeveloped properties, and three as not in VPA territory.
[250] Response to Preliminary Finding #26.

At the workshop held on June 12, 2008, in Harrisburg, Verizon and the Commission Staff agreed that for the purpose of reporting compliance with the commitment for broadband facilities for public schools, health care facilities, and industrial parks, "adjacent" means that the facilities can be provisioned within commercially reasonable timeframes (ten business days for 1.544 Mbps and above, and 60 days for 45 Mbps and above). Verizon also committed to meeting 100 percent availability going forward to all qualifying public schools, health care facilities, and industrial parks (despite the fact that it is after December 31, 2005) and to maintain updated lists of public schools, health care facilities, and industrial parks, to be able to demonstrate that it is in compliance. (See also Findings 1-15 and 1-16). Liberty believes that this agreement constitutes satisfactory resolution of Finding 1-14 (as well as Findings 1-15 and 1-16).

Finding 1-15: Based on its interpretation of Act 183, Verizon indicated that it is no longer legally required to place fiber in or adjacent to the nearest right-of-way for any new public schools, health care facilities, or industrial parks constructed after December 31, 2005.

The NMP requires that Verizon make broadband facilities available in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks in Pennsylvania. According to the Sixth Biennial Update, VPA met this commitment for 100 percent of these facilities at year-end 2005. However, based on Verizon's interpretation of Act 183, it is no longer committed to make broadband available to any new public school, health care facility, or industrial park constructed after 2005. Verizon stated: [251]

> *Pursuant to 66 Pa. C.S §3014(b)(4), "[a] local exchange telecommunications company that elects under paragraph (1), (2) or (3) shall also commit to universal broadband deployment in or adjacent to public rights-of-way abutting all public schools, including administrative offices supporting public schools, industrial parks and health care facilities in its service territory* ***on or before December 31, 2005.****" Verizon met this commitment by having such facilities in place on or before December 31, 2005. Given the competitive marketplace today, any facilities constructed after that time would have ample access to fiber-based services, including assess from Verizon Pennsylvania. Because Act 183 put an end date on the commitment, however, Verizon no longer is legally required to place fiber to the right of way of new facilities constructed after December 31, 2005.*

In fact, as noted in Finding 3-3 in Chapter 3, Liberty found in its physical audit one school on VPA's master list where VPA was not in compliance as of December 31, 2005. Liberty also found instances, as noted in Finding 1-14, where schools were not identified on VPA's master list and, as noted in Finding 1-16, that VPA is apparently not maintaining a complete, up-to-date list of schools, industrial parks and health care facilities operating in the state. As a result, even if one accepts VPA's contention that the mandate to provide such fiber access ended as of

[251] Response to Data Request #177.

December 31, 2005, Liberty questions how VPA can claim they complied by that date. Even more so, given its position that it is was relieved of this requirement after December 31, 2005, VPA cannot provide assurance of providing broadband facilities in or adjacent to the nearest right-of-way for schools, health care facilities or industrial parks built since 2005. However, Verizon does not agree with this conclusion, stating that "[g]iven the robust deployment of fiber in Verizon's network such facilities are *likely* to have nearby fiber even without any legal obligations to place it [emphasis added]."[252]

Commission Staff has informed Liberty that it disagrees with Verizon's interpretation of Act 183, as the Act does not state that any such facilities constructed after December 31, 2005, will be exempt from this universal broadband requirement. Furthermore, according to Commission Staff, 66 Pa. C.S. § 3011 (2) reconfirms that it is the policy of this Commonwealth to "Maintain universal telecommunications service at affordable rates while encouraging the accelerated provision of advanced services and deployment of a universally available, state-of-the-art, interactive broadband telecommunications network in rural, suburban and urban areas, *including deployment of broadband facilities in or adjacent to public rights-of-way abutting public schools, including the administrative offices supporting public schools, industrial parks and health care facilities*." [Emphasis added.] Finally, Staff noted that VPA's NMP incorporated universal deployment to all schools, industrial parks, and health care facilities that are being built; otherwise the spirit, if not the letter, of the commitment would be denigrated by Verizon's failure to provide broadband deployment to these new entities after December 31, 2005.

Recommendation 1-15: Determine the requirements for compliance with the NMP commitment to have broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks.

Verizon cannot assume it has been relieved of this requirement based on its interpretation of Act 183. Although VPA asserts that Act 183 absolved it of any need to make broadband facilities available to public schools, health care facilities, and industrial parks after 2005, this is not obvious to Liberty. VPA needs to clarify with the Commission its future obligations with respect to this commitment.

See the discussion of Recommendation 1-14 for a resolution of this matter.

Finding 1-16: Verizon's process for provisioning broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks does not provide an audit trail to enable verification that VPA has complied with this NMP commitment.

In its Sixth Biennial Update, VPA reported that it had met the NMP commitment to make broadband available in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks by year-end 2005. However, Liberty has identified a number of

[252] Response to Preliminary Finding #11.

flaws in Verizon's process for making this determination which leaves doubt that Verizon can report on this requirement with any degree of certainty. These flaws include the following:

- Verizon developed its master list of schools, health care facilities, and industrial parks in 1994/1995 based on local community resources such as the "blue pages" section of the local telephone directories and the personal knowledge of its local engineering personnel. Verizon updated the list in 1999 to include the charter schools based on a Pennsylvania PUC order. However, Verizon has not updated the master list of these target facilities since 2000 making it questionable whether Verizon has knowledge of all the schools, health care facilities, and industrial parks that exist within its service territory.[253]
- Subsequent to 2000, Verizon updated its Engineering Guidelines requiring its local engineers to issue the work orders needed to provision fiber cable to the adjacent public right-of-way of any new qualifying site. Verizon reinforced this policy to its field engineers in document NP-G-2003-013, issued in April 2003. Verizon relies solely on its local engineers to follow these guidelines; it does not maintain a database of the facilities that its local engineers are required to update by providing the fiber work order information used to install the fiber facilities in the adjacent right-of-way.[254]
- Verizon determined that it met its 100 percent compliance commitment for this NMP requirement by a manual look-up of the facility records conducted by the local engineers responsible for maintaining these records.[255]
- The NMP requirement for schools, health care facilities, and industrial parks states "deployment of broadband facilities in or *adjacent* to public rights-of-way *abutting* public schools, including administrative offices supporting public schools, industrial parks and health care facilities." [emphasis added][256] Verizon has indicated that the statute does not define "adjacent" or "abutting." As such, Verizon has interpreted "adjacent" generally to mean passing next to the location.[257] However, based on information provided by Verizon, the fiber available to a school facility can be as much as 2,500 feet away.[258] Verizon has indicated that the adjacent/right-of-way/abutting the facility does not have to be the nearest telephone pole or manhole that serves the facility.[259]

[253] Response to Data Request #132.
[254] Responses to Data Requests #132 and #176.
[255] Response to Data Request #176.
[256] 66 Pa. C.S. § 3011(2).
[257] Response to Data Request #207.
[258] Response to Data Request #206. In this data request, Liberty provided a sample of 99 school facilities that it found that were not on Verizon's master list and inquired about the status of these 99 locations. In its response, VPA provided an attachment that indicated the school locations where it had fiber facilities available. In some cases, on this attachment, VPA provided details of where these fiber facilities were located. The range of availability on this attachment ranged from "fiber coiled at pole across the street" to "fiber available approximately 2500 feet away."
[259] Response to Data Request #174. Liberty acknowledges that the statute is not clear on this point and is subject to interpretation. Liberty also acknowledges that it is not always economical to provision fiber facilities to the nearest right-of-way if the school facility has not ordered broadband service.

By not maintaining its master list of schools, health care facilities, and industrial parks, Verizon does not have a complete inventory of these locations. Verizon also has no mechanized process for determining whether its engineers are in compliance with its engineering guidelines and the NMP requirement to provision fiber facilities to these locations. Additionally, Verizon's interpretation of "adjacent" and "abutting" when provisioning fiber facilities to these locations may not be in the spirit intended by the statute. With its current process, Verizon cannot certify that it has met and continues to meet its 100 percent commitment to be compliant with this NMP requirement.

Verizon agreed that it developed its master list of schools, health care facilities, and industrial parks in the 1994/1995 timeframe. However, Verizon disagreed with Liberty's statement that it has not maintained this list. Verizon stated that its local engineers are in the best position to know when a new facility has been added to their area of responsibility. Verizon also disagreed with Liberty's finding that Verizon's interpretation of "adjacent" and "abutting" may not be in the spirit intended by the statute. Verizon interprets "adjacent" generally to mean passing next to the location. Finally, Verizon disagreed with Liberty's conclusion that Verizon cannot certify that it has met its 100 percent commitment for this NMP requirement. Verizon indicated that it "has made a better than good faith effort to comply with this commitment." Verizon also indicated that "[i]n the absence of any comment or direction from the PUC staff following the filing of the previous five biennial updates Verizon presumed silence as acceptance of compliance with this requirement."[260]

Recommendation 1-16: Develop an updated centralized master list of public schools, health care facilities, and industrial parks and continue to update this list when new facilities are added and others are retired.

VPA's manual process for maintaining its master list of these qualified facilities that require broadband availability under this NMP obligation is insufficient. VPA needs to develop and maintain a centralized master list of these facilities in order to facilitate provisioning of broadband and for internal or external audits purposes.

See the discussion of Recommendation 1-14 for a resolution of this matter.

Finding 1-17: The fiber optic cable conductor miles reported by VPA in its Sixth Biennial Update do not depict the actual conductor miles available for service in Pennsylvania.

In its Sixth Biennial Update, VPA provided a graph that reflects its cumulative fiber optic cable deployment in Pennsylvania from 1994 through 2006.[261] According to this graph VPA has deployed 1,361,663 conductor miles of fiber optic cable as of year-end 2006. However, the graph does not reflect or make note of the miles of fiber cable conductors that VPA has retired during

[260] Response to Preliminary Finding #14.

[261] Conductor miles represent the miles of fiber cable deployed multiplied by the number of fibers contained within these cables.

this time. According to VPA it has retired 69,609 miles of fiber conductors resulting in 1,292,054 total fiber conductor miles available for customer service in Pennsylvania.[262]

Verizon agreed with Liberty's finding that the graph depicts cumulative fiber optic cable deployment from 1994 through 2006 and does not account for retired fiber. However, Verizon disagreed that the graph could give the reader an inaccurate representation. Verizon stated that the NMP Reporting Guidelines do not require that VPA provide this information and VPA simply provides this information to give the Commission additional information and some historical perspective on fiber deployment.[263]

Recommendation 1-17: Modify reporting of fiber facilities that Verizon has deployed and that are available for customer service in future biennial updates to account for fiber cable conductor miles that have been retired.

Verizon's method of presenting data on fiber optic cable could give readers of the VPA biennial updates an incorrect indication of the amount of fiber cable available for customer service.

[262] Responses to Data Requests #22 and #193.
[263] Response to Preliminary Finding #20.

III. Task Area 3: Physical Audit of Verizon's Equipment and Outside Plant Facilities

A. Purpose and Background

In Task Area 3, Liberty provided physical verification of whether the equipment and facilities installed in VPA's network coincide with its outside plant and central office equipment inventory records used to support the Sixth Biennial Update. This task area addressed the following matters:

1. Physical verification of NMP topic areas examined by Liberty during its Task Area 1 review
2. Physical verification of broadband availability using a sample of lines (RFP item #8).
3. Physical verification of reported progress in providing broadband adjacent to health care facilities, public schools, and industrial parks using a sample of such facilities (RFP item #14).

In order to complete this work, Liberty performed three primary tasks:

1. Liberty visited a sample of Verizon's outside plant and central office facilities used to provide broadband services.
2. Liberty tested the validity of VPA's assumptions equating loop length with broadband/DSL availability by testing for the maximum data speed capabilities of a sample of DSL lines.
3. Liberty verified the quality of the database used by VPA for inventorying its loop lengths by performing circuit tests on a sample of the working lines in VPA's service area.

B. Analysis

Sampling plan summary

In order to provide coverage to the over four million access lines and 386 central offices in VPA's service area, Liberty created a statistical sampling plan involving three separate samples and testing methods.[264] This sampling plan consisted of three parts: i) a plan for the audit of VPA central offices and outside plant equipment and facilities, ii) a plan to test the validity of VPA's broadband and DSL availability assumptions, and iii) a plan to test the accuracy of the loop length data in Verizon's Golden Source database.[265] A detailed description of the sampling

[264] Response to Data Request #12.
[265] For a detailed description of the Golden Source database, see the section II on Task Area 1 and 2.

process used by Liberty to extract these three samples can be found in Appendix A to this report. Appendix A also lists the specific wire centers Liberty visited as part of the physical audit.

For the physical audit of VPA's central offices and outside plant equipment and facilities, Liberty selected a random sample of central offices for its site visits based on a stratification (grouping) of the central offices by VPA's five local access transport areas (LATAs) and by exchange classification (urban, suburban, and rural) within the LATAs. Liberty used this sample for physical verification of the equipment and facilities VPA has installed in the wire centers served by the sampled central offices as compared to the inventory records used by VPA for NMP reporting. Liberty also used this sample of wire centers for the physical verification of VPA's reported progress in providing broadband facilities adjacent to health care facilities, public schools, and industrial parks.

To test the validity of VPA's broadband and DSL availability assumptions,[266] Liberty selected a stratified random sample of working DSL lines from the entire population of working DSL lines in VPA's service area. Liberty stratified this population according to loop length, in order to test the dependence of broadband qualification on loop length.

Finally, to test the accuracy of the loop length data found in Verizon's Golden Source database, Liberty selected a random sample of working POTS and DSL lines from the entire population of working POTS and DSL lines in VPA's service area. Liberty compared this sample to loop length information on the sampled lines provided by Verizon's Celerity or MLT testing tools with the information contained in Verizon's Golden Source database.

Physical verification of NMP topic areas examined by Liberty during its Task Area 1 review

Liberty performed its inspection of VPA's central offices and its outside plant equipment using a team of three highly qualified telecom industry experts. As former Verizon (Bell Atlantic) managers and as independent consultants they have over 100 years of telecommunications industry experience among them. This experience ranges from the operations and maintenance of the telecommunications network to extensive experience auditing and performing root-cause analysis studies of telecommunications networks throughout the country. Prior to conducting the VPA central office visits, the team developed its approach for conducting the inspections based on the team members' knowledge of the industry and the technology used, as well as on the reporting requirements of the NMP. The team used this plan, along with the inspection worksheets that it had developed, to make the site visits as efficient and productive as possible.

While conducting its central office inspections Liberty verified that all switches in the central offices visited were the digital switch type specified in VPA's records (*i.e.*, 5ESS, DSM-100,

[266] For NMP reporting purposes, VPA assumes that all loops that are 12 kft or less in length are qualified to provide broadband service at 1.544 Mbps or greater and that all loops between 12 kft and 18 kft in length are qualified to provide DSL service at data speeds less than 1.544 Mbps.

5RSM, EWSD). Liberty found that VPA's records accurately indicate the switch type in operation at each location visited.

VPA's inventory records indicated that it deployed two types of DSL DSLAM equipment in its central offices, ASAM 7300s and ADSL 1000s. Liberty verified that the DSLAM equipment inventoried by VPA was:

- Installed in each of the central offices visited;
- Installed in the equipment relay rack locations indicated by VPA's inventory records;
- Powered for service; and
- Cabled to and terminated on the main distribution frame for connection to the access lines served by the central office for the provision of DSL service if requested on those lines.

Based on Liberty's analysis of the DSLAM ports available to support CO-based DSL service and the lines in-service in the 23 central offices, Liberty determined that, on average, VPA had approximately **(Begin Proprietary) (End Proprietary)** spare ports per central office available to meet future DSL service requests. The smallest number of spare DSL ports was found in the McVeytown central office, which had **(Begin Proprietary) (End Proprietary)** spare DSL ports, corresponding to **(Begin Proprietary) (End Proprietary)** percent of the **(Begin Proprietary) (End Proprietary)** total working lines in that office. The office with the greatest number of spare ports was the Pittsburgh East Liberty office with **(Begin Proprietary) (End Proprietary)** spare DSL ports, which corresponded to **(Begin Proprietary) (End Proprietary)** percent of the total working lines in that office. Given these numbers, Liberty found that VPA had sufficient spare DSL capacity to meet immediate DSL service demands. Liberty also observed that VPA had installed but not activated new ASAM 7300 frames to expand DSL capacity in three of the offices visited.

Ten of the central offices visited by Liberty supported remote terminals equipped to provide DSL service using PARTS technology. PARTS DSL requires the remote terminal to be connected, via fiber facilities, to an OCD installed in the central office.[267] According to its inventory records VPA deployed CBX-500 OCDs in each of these ten central office locations. Liberty verified that the OCD equipment inventoried by VPA to support PARTS DSL was installed as documented in VPA's inventory records in each central office. Liberty also verified that this equipment was powered. With one exception, Liberty verified that the circuit identification for the fiber facility circuit connecting the OCD equipment with the remote terminal agreed with that inventoried in VPA's records. The one exception occurred in the Williamsport central office, where the central office technician assigned to work with Liberty was unable to access the central office facility records needed to perform this verification. Liberty concluded that VPA installed the OCD equipment in accordance with its equipment inventory records and, with the exception of the Williamsport office, where the records were unavailable and thus could not be verified, this

[267] Response to Data Request #127.

equipment is connected to the PARTS remote terminals served by these offices via the fiber facilities shown on VPA's facility records.

Thirteen of the 23 central offices visited by Liberty contained host switches. A host switch is a switch that provides certain functions, such as out-of-band intelligent signaling and interoffice transport to smaller, remotely located switches, known as remote switching units. In addition, like other local switches, the host switch provides end-office switching services and features to those customers whose access lines are connected directly to the switch or are connected to the switch by a remote terminal served by that switch. Liberty sampled 42 of the interoffice transport trunk groups connected to these 13 central office switches in order to verify that these trunk groups were provisioned on fiber facilities. To conduct this verification, Liberty observed the switching equipment that the fiber facility was connected to and compared the designation of the transport system in the office to the designation on the facility records. Liberty then requested that a VPA technician make a test call to the distant switch that the sampled interoffice trunk group was connected to and trace the call to ensure that it was routed on the fiber facilities identified by VPA's facilities records. Liberty concluded that each of the sampled interoffice trunk groups were provisioned over fiber transport facilities.

According to its inventory records, VPA has deployed three different types of PARTS remote terminal equipment to provide DSL service in the Carrier Service Areas supported by these remote terminals. These PARTS remote terminal equipment types are Alcatel Litespan 2000, Tellabs Access Max, and Catena SLC Series 5. During its field visits, Liberty asked VPA to allow it to inspect 38 of the 80 PARTS remote terminals in the service area of the 23 offices selected for site visits. Liberty determined that all 38 of the PARTS remote terminals visited were installed and that they were powered and available for service, consistent with VPA's inventory records.

According to its inventory records, VPA deployed Overlay DSL equipment in seven remote terminals served by three of the 23 Central Offices. The Overlay equipment types used by VPA are ADTRAN 1124 (mini-DSLAMS) and Remote 7300 ASAM. While conducting its inspections of the remote terminals in the field, Liberty inspected all seven of the remote terminals containing Overlay DSL equipment and verified that this equipment was installed according to VPA's inventory records. Liberty also validated that the umbilical facilities that connected these remote units to the central office were in accordance with VPA's inventory records. Liberty concluded that VPA's remote terminals deployment was in agreement with its equipment inventory records.

Liberty examined a sample of VPA's working fiber facilities in the central offices visited and found that VPA's Network Engineering Fiber Optic Cable Inventory Records (FOCIRs) do not always accurately reflect the number of actual working fibers found in VPA's network. Liberty also attempted to verify that 100 percent of the spare fiber facilities inventoried in VPA's FOCIR existed in the central offices visited but found that VPA's FOCIR do not accurately represent the number of spare fibers in VPA's network. These matters are discussed in detail in Finding 3-1.

While conducting its spare fiber investigation, the VPA technician that was assigned to accompany Liberty was unable to physically locate all four of the fiber facility cables inventoried by VPA as being available for service in its Wyoming central office. As a result, Liberty assumed that these cables did not exist and noted this to Verizon. In response, Verizon stated that, subsequent to Liberty's field audit of this office, a VPA Outside Plant Engineer went to the Wyoming central office and was able to locate the missing cables identified by Liberty.[268] Despite the ability of VPA's engineer to locate these cables subsequent to Liberty's inspection of this office, the fact that one of its technicians could not locate the fiber cables in the central office based on the information available on VPA's fiber facility records, particularly in a central office as small as Wyoming, highlights Liberty's concerns regarding VPA's non-standard manual process for maintaining these records as noted in Finding 1-2 and Recommendation 1-2.

While conducting its review of VPA's FOCIRs Liberty determined that VPA's inconsistent methods for maintaining its fiber facility records may result in inaccurate records and an overstatement of the spare fiber facilities available for service in a central office. This is discussed in detail in Finding 3-2.

Physical verification of reported progress in providing broadband adjacent to health care facilities, public schools, and industrial parks

Liberty inspected a total of 111 health care facilities, schools, and industrial parks served by the central offices included in the physical audit sample of central offices. Liberty found that Verizon had fiber facilities in or adjacent to the nearest right-of-way in all but one of the locations inspected. This is discussed in Finding 3-3 below.

Physical verification of broadband availability

Liberty's original audit plan was to conduct testing to determine broadband qualification on a sample of lines served by the central offices selected for the physical inspections during its central office visits. However, VPA informed Liberty that it was not capable of performing the tests that Liberty wished to conduct from its central office locations, and indicated that its central office technicians are not trained or equipped to perform these tests. According to VPA, Verizon conducts all of the circuit testing that Liberty wanted VPA to execute from centralized remote locations.[269] Based on VPA's inability to support the circuit testing from the specific central office locations, Liberty adjusted its test plan to accomplish this testing from Verizon's centralized test location in Maryland using a sample of lines drawn from the entire population of working access lines in the VPA service area. The testing was conducted using Verizon's National xDSL Test Tool (NXTT), which allows Verizon to program the telephone numbers of the lines to be tested into its test scheduler along with the identification of the tests to be

[268] Response to Preliminary Finding #25.
[269] Response to Data Request #278.

conducted on each line.[270] Once scheduled, the test equipment located in each central office runs the tests and returns the test results to the centralized test center where they are automatically populated onto Excel spreadsheets for distribution and review.[271]

In order to ensure that the proper controls were in place for the bulk circuit testing performed by Verizon on Liberty's behalf, Liberty did not make Verizon aware of the specific lines selected for the tests until the day the testing was scheduled to be performed. Liberty supplied Verizon with two Excel files of telephone numbers to be tested. One file contained approximately 3,000 DSL lines that were to be used for the DSLAM sync rate tests, which provide information on the maximum data speed rate the tested line is capable of supporting based on the physical characteristics of the line, and the other file contained 1,000 POTS and DSL lines that were to be used for MLT and Celerity attenuation testing that are described in the Task Areas 1 and 2 chapter of this report.[272] Liberty supplied this information to Verizon in an Excel format for ease of NXTT scheduling. Verizon scheduled the tests requested by Liberty to be run during the evening of the same day Liberty provided the list of lines to be tested. On the next day, Verizon provided Liberty, in Excel spreadsheets, the results of the tests run the previous evening. In order to verify these test results, a team of Liberty professionals went to a Verizon location in Harrisburg the day after Verizon supplied the results to Liberty. Over the course of the next three days, this team observed VPA personnel performing individual retests on 450 of the lines tested using the bulk testing process. Liberty then compared these retest results to the bulk test results to ensure that there were no significant differences in the test results that would cast doubt on the validity of the bulk testing performed by Verizon. Liberty found that the differences between the retest results and the bulk test results were not statistically different from zero, indicating that the bulk test does not lead to bias in the average results, as compared to a manual test.

As part of this bulk testing, Liberty used the testing capabilities of the DSLAM Element Management System (EMS) to test for broadband capability of the sampled lines. EMS is a feature of the DSLAM that allows for remote access to the DSLAM to obtain individual circuit information, such as the maximum attainable data speed of a line, without requiring physical access to the DSLAM.[273] Because of the need to have a DSLAM provisioned on the line, Liberty limited this testing to working DSL circuits.[274] Liberty used the bulk testing process previously described. To perform the bulk testing on the sample of DSL lines identified by Liberty, Verizon accessed the DSLAM EMS using the NXTT located in its centralized test center and provided Liberty with the test results on 2,827 of the sampled lines.[275] Liberty then compared the maximum attainable data speeds available on each of the lines according to the bulk test results with the data speeds implied by the loop length of the line as inventoried in Verizon's Golden Source database. Verizon determines the maximum attainable data speed on the line by the "Intr

[270] Response to Data Request #238 and Interview #15, January 7, 2008.
[271] Interview #15, January 7, 2008.
[272] More detail on the purpose of each of these tests will be provided later in the report.
[273] Response to Data Request #238.
[274] DSLAMs are not required on POTS lines.
[275] Test results were not received on all lines in the sample due to test access problems causing a test access timeout. These problems can occur for various reasons including, line in trouble, line in use, and customer disabled the modem located at the customer's premises.

Max Attainable BR" field from the test results.[276] The value populated in this field is the maximum speed the line is capable of based on the physical make-up of the line.[277] As discussed in Finding 3-4, Liberty's analysis of these test results found that Verizon relies on flawed broadband qualifications assumptions.

To verify the accuracy of the loop lengths populated in VPA's Golden Source database, Liberty used Celerity/MLT test results provided by VPA on a sample of existing POTS and DSL lines. Liberty found that Verizon's Golden Source database does not always contain the most accurate loop length information available to Verizon. This is discussed in detail in Finding 3-5.

C. Findings and Recommendations

In general, Liberty determined from its physical audit, that for the sample of central offices and central office serving areas it examined;

- The equipment installed in VPA's network coincides with the VPA's inventory records for this equipment, with the exception of its working and spare fiber facilities.
- VPA has installed fiber facilities in or adjacent to schools, health care facilities and industrial parks, with one exception.
- VPA fiber facility inventory records do not accurately reflect the working and spare fibers installed in VPA's network.
- VPA's inconsistent methods for maintaining its fiber facility records may result in inaccurate records and an overstatement of the actual spare fiber facilities available for service in a wire center.

Liberty has the following specific findings and recommendations based on its analysis in Task Area 3.

Finding 3-1: Verizon's Network Engineering Fiber Optic Cable Inventory Records do not accurately reflect the number of actual working fibers or the number of spare fibers in VPA's network.

As part of its review of equipment in a sample of 23 central offices, Liberty inspected the fiber strands terminating in these central offices shown to be working facilities on Verizon's Network Engineering Fiber Optic Cable Inventory Records to verify the presence of these facilities and the accuracy of Verizon's inventory records. Liberty reviewed the status of 466 fiber strands contained in 148 fiber cables that Verizon's Fiber Optic Cable Inventory Records identified as working in these 23 central offices. Liberty found that 89 (19.1 percent) of the fiber strands that

[276] According to the response to Data Request #274, for lines served by PARTS technology, Verizon calculates the maximum attainable rate using the values found in the "Fast Channel Bit Rate" and the "Relative Capacity" data fields.
[277] Response to Data Request #298.

Verizon identified as working did not have the fiber connectors needed to make fiber facilities operational. This indicates that these 89 strands are not working fiber strands, as Verizon indicated, but rather are spare fiber strands. (See Table 3-1 for a full list of these 89 fiber strands.) Of the remaining 377 fiber strands that Liberty found to actually be working, 98 (26.0 percent) had untagged fiber connectors. (See Table 3-2 for a full list of the untagged fiber strands.) Verizon uses fiber connector tags to identify the fiber strand and its associated optical equipment for ease of maintenance and service restoration by the central office technicians.

Additionally, in two instances, one in the Dauphin central office and the other in the Media central office, Liberty could not locate the fiber cable listed on Verizon's Fiber Optic Cable Inventory Records on any of the central office's Fiber Termination Shelves in the Fiber Cross-connect Bay, which indicates that these fiber facilities do not exist. Finally, in the Mount Carmel central office, Liberty found two fiber cables in service that Verizon did not inventory in its Fiber Optic Cable Inventory Record.

Table 3-1

VPA Fiber Facility Inventory Records Inaccuracies – Strands Inventoried as Working but Found to be Spare in the Central Office (Missing Fiber Jumpers)

(Begin Proprietary)

(End Proprietary)

Table 3-2

VPA Working Fiber Connectors Not Properly Tagged in the Central Office

(Begin Proprietary)

(End Proprietary)

Liberty also inspected in the 23 sampled central offices the fiber strands terminating that were listed as spare facilities on Verizon's Network Engineering Fiber Optic Cable Inventory Records to verify the accuracy of Verizon's inventory records, and to verify that these facilities were actually spare and available for future service requests from customers. Liberty reviewed the status of 7,581 fiber strands contained within 155 fiber cables that Verizon's Fiber Optic Cable Inventory Records identified as spare strands in these central offices. Liberty found that 325 or 4.3 percent of these fiber strands were equipped with fiber jumpers indicating that these were working facilities, rather than spare fiber as indicated by Verizon's inventory records. In summary, see Tables 3-3 and 3-4.

Table 3-3

Summary of the Results from Liberty's Review of the Fiber Facilities that VPA Inventoried as Spare Strands in the Central Offices

Number of central offices visited	Number of central offices with incorrect fiber inventory records	Number of cables inspected in all the central offices visited	Number of fiber strands inspected in all the central offices visited	Number of cables containing strands inventoried incorrectly	Total number of strands inventoried incorrectly
23	15	155	7,581	55 (35.5%)	325 (4.3%)

Table 3-4 provides the details for each central office visited.

Table 3-4

VPA Fiber Facility Inventory Records Inaccuracies – Strands Inventoried as Spare but Found to be Working in the Central Office (Fiber Jumpers Present)

(Begin Proprietary)

(End Proprietary)

Additionally, Liberty could not find three cables, consisting of 28 fiber strands, inventoried by Verizon as spare fiber in its Fiber Optic Cable Inventory Records. Table 3-5 identifies the three missing cables.

Table 3-5

VPA Fiber Facility Inventory Records Inaccuracies - Fiber Cables VPA Inventoried as Spare Facilities that Liberty did not find in the Central Office

(Begin Proprietary)

(End Proprietary)

Liberty also found two fiber cables with spare capacity on the central office Fiber Termination Shelf, which did not appear in Verizon's Fiber Optic Cable Inventory Record. Liberty found the first fiber cable, with **(Begin Proprietary) (End Proprietary)** spare fiber strands, in the Dauphin central office and the second, with **(Begin Proprietary) (End Proprietary)** spare fiber strands, in the Philadelphia Eastwick central office. Both cables, identified in Table 3-6, should have been inventoried as spare capacity on the Fiber Optic Cable Inventory Record but were not.

Table 3-6

VPA Fiber Facility Inventory Records Inaccuracies - Spare Fiber Capacity Found in the Central Office but not Recorded on VPA's Inventory Records

(Begin Proprietary)

(End Proprietary)

Verizon agreed with Liberty's observations, indicating that there are "inadvertent inaccuracies" in its Outside Plant fiber records. Verizon provided some of the reasons why VPA's records show fiber facilities as working when they are spare, including i) reserving fibers for anticipated demand that does not materialize because it is delayed or cancelled and the reservation is not cleared by the regional engineer and ii) fiber swaps performed to resolve a maintenance problem that are not reflected in the inventory records.[278] However, Verizon disagreed with Liberty on the impact of inaccurate spare fiber facility records. VPA stated that Liberty could not assume that the presence of a fiber jumper on the termination block always indicates that the fiber is working. VPA indicated that its practice is to remove the fiber jumpers when the fiber is no longer in use, but at times the central office technician will inadvertently leave the fiber jumpers

[278] Response to Preliminary Finding #33.

in place.[279] Verizon also indicated that another reason for some of the discrepancies was "inadvertent Verizon clerical errors in preparing the field visit documentation." According to Verizon, these errors involved the inventory information provided to Liberty on one fiber cable in its Carrick office (cable CA30006) and all five of the fiber cables in its East Liberty office. Verizon asserted that the information in its inventory records for these cable strands is correct but the information provided to Liberty was in error.[280]

Recommendation 3-1: Conduct a statewide internal audit to compare the working and spare fibers in the central office to VPA fiber facilities inventory records and update the facility inventory records so that they accurately reflect the actual working and spare fiber strands in VPA's network.

Inaccurate fiber facility inventory records prevent VPA from providing an accurate assessment of its actual working and spare fiber capacity. These inaccurate records result in the misreporting of the availability of broadband service at data speeds of 45 Mbps or greater within commercially reasonable time, because VPA determines it has met this commitment in 100 percent of its central offices "by design" based on its fiber deployment plans and manual inventory records.[281] Inventory records that reflect spare fiber that does not actually exist in the VPA network will lead to a misrepresentation of VPA's actual ability to meet this NMP commitment in each of its central offices. Inaccurate inventories can also result in provisioning delays if Verizon's provisioning systems attempt to schedule work based on fiber facilities that VPA has inventoried as spare, but that are actually working or do not exist in the central office.

Finding 3-2: VPA's inconsistent methods for maintaining its fiber facility records may result in inaccurate records and an overstatement of the actual spare fiber facilities available for service in a central office.

During its physical inspection of the Wyoming, PA central office, Liberty observed that the manual fiber facility records provided by Verizon for that central office used a different format and standard from the process used for the facility records of the four central offices in LATA 230 and the four other central offices in LATA 232 that Liberty physically inspected.[282] Liberty noted the following two record keeping inconsistencies that can lead to misreporting of total spare fiber facilities:

- For interoffice facility fibers that passed through but did not terminate in the Wyoming central office, VPA listed both working and spare pairs. In the other central offices that Liberty inspected, VPA identified these "through" facilities as

[279] In its response VPA did not indicate that it did a study to determine how often VPA's technicians left the jumpers in place on the fiber facilities identified by Liberty in its finding. VPA just speculated that this may be one reason why these facilities, identified as spare in VPA's inventory records, appeared to be working in the central office.
[280] Response to Preliminary Finding #35.
[281] Response to Data Request #184.
[282] See Finding 1-2 for more information regarding Verizon's lack of a mechanized or standardized method for inventorying its fiber cable facilities.

N/A (Not Applicable) with respect to the spare fiber capacity on the facilities. Spare fibers on these through facilities are not available for customer service from the Wyoming central office and, as such, should not be shown as spare capacity for that office. The fiber cables that transit through the Wyoming central office and have spare fiber capacity recorded are:

(Begin Proprietary)

(End Proprietary)

- The fiber facility records for the Wyoming central office appeared to identify a fiber pair as both "Working" and "Spare" in several of the interoffice facility cable counts. Additionally, the count of spare fibers and total spares did not always agree. As illustrated in the table below, the engineering records for the Wyoming central office list the same fibers as both working and spare for the two cables.[283]

Table 3-7

VPA Fiber Facility Inventory Records Inaccuracies - Interoffice Facilities that Passed Through the Wyoming Central Office that VPA Incorrectly Inventoried as Spare

(Begin Proprietary)

(End Proprietary)

Inconsistent procedures for recording fiber facilities can lead VPA to make an inaccurate determination of the spare facilities that actually exist in its network. They may also impede VPA's ability to provision broadband service to its customers in a commercially reasonable timeframe.

In response to this finding, Verizon indicated that the cables identified by Liberty pass through a splice case in the Wyoming central office cable vault and, if necessary, VPA could use these cables by splicing into them to provide broadband service. Verizon also indicated that the original table containing inventory records provided to Liberty for its audit of the Wyoming central office was "inconsistent in its presentation of information" and provided the corrected fiber facility information for this office in its response.[284]

There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-2: "Implement the systems and software required to

[283] The facility records maintained by the other central offices visited by Liberty, however, clearly identified specific fibers as either working or spare.
[284] Response to Preliminary Finding #30.

mechanize VPA's fiber facility records. Until such a mechanized system is developed and operational, standardize the method used for maintaining the manual fiber facility records."

Finding 3-3: Liberty's physical audit of VPA's outside plant facilities revealed that VPA did not have fiber facilities available in or adjacent to the nearest right-of-way for 100 percent of the public schools, health care facilities, and industrial parks as reported by VPA in its Sixth Biennial Update.

Liberty's physical audit included an inspection of the fiber facilities provisioned by VPA at or adjacent to the nearest right-of-way to 111 public schools, health care facilities, and industrial parks served by a representative sample of 23 central offices located in the VPA service area. As shown in the table below, Liberty observed that eight of the 111 sites did not have fiber facilities at the nearest right-of-way. However, seven of these eight locations did have fiber facilities in the general vicinity (*i.e.*, within 0.2 miles) of the school, health care facility, or industrial park. For the last of the eight locations, an elementary school located in Bradford, Liberty found that the nearest VPA fiber facility was almost three-quarters of a mile away from the nearest right-of-way. However, Liberty also observed that this school had a VPA competitor's fiber facility terminated in the school building.

Title 66 of the Pennsylvania Consolidated Statutes provides the requirement that broadband deployment be "in or adjacent to public rights-of-way abutting" schools, health care facilities, and industrial parks.[285] Verizon has noted that it defines "adjacent" as "generally to mean passing next to the location."[286] Given this interpretation, one could construe the seven nearby facilities as meeting the requirement. However, VPA's fiber facility is far enough from the elementary school in Bradford to require significant work to provision broadband service there and thus does not appear to meet the spirit of the Consolidated Statutes.

Table 3-8

Public Schools and Health Care Facilities without VPA Fiber at the Nearest Right-of-Way

Central Office	Location Name	Address	Approximate distance of nearest fiber facility	Comments
Bradford	Bradford Manor Nursing home	50 Langmaid Lane	0.2 miles	5 telephone poles away from closest ROW
Bradford	George Blaisdell Elementary School	265 Constitution Ave.	0.7 miles	Fiber terminated inside school from VPA competitor. Nearest VPA fiber found on intersection of Constitution & Steward Ave about 3/4 mile from school building.
Reynoldsville	C.G. Johnson	923 Jackson St	~400 feet	2 Telephone poles away from

[285] 66 Pa. C.S. § 3014(b)(4).
[286] Response to Data Request #207.

	Elementary School			closest ROW
Monongahela	Haven Crest Nursing	1277 Country Club Rd.	0.1 miles	4 telephone poles away from closest ROW
Coraopolis	West Hills Personal Care Home	951 Brodhead Rd.	~250 feet	2 telephone poles away from closest ROW
Millersville	Oak Leaf Manor North Nursing Home	South 2101 Wabank Rd.	~100 feet	1 telephone pole away from closest ROW
Oxford	Oxford Manor Nursing Home	7 East Locust Street	~300 feet	1 telephone pole away from closest ROW
Evergreen	Powel Public School	301 N. 36th St	~400 feet	2 telephone poles away from closest ROW

Liberty's physical audit confirms Liberty's observations from its review of Verizon's records, that Verizon's claim to be compliant with the requirement to have fiber facilities available in or adjacent to 100 percent of schools, health care facilities, and industrial parks is not accurate and potentially misleading. The extent to which Verizon is not compliant with this requirement depends on the interpretation of the phrase "adjacent to."

Verizon stated that nothing in the physical audit calls into question VPA's compliance with the NMP commitment to have fiber facilities available in or adjacent to 100 percent of schools, health care facilities, and industrial parks. Verizon stated that "where fiber is passing next to a location in close enough proximity that broadband service could be provided over fiber to the location within 10 days of a customer request, then that fiber is 'adjacent' to the location under both the letter and the spirit of Act 183."[287]

There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-14 in the Task Areas 1 and 2 chapter: "Propose a definition of the requirements of the NMP commitment to have broadband facilities in or adjacent to the nearest right-of-way for public schools, health care facilities, and industrial parks and obtain agreement on this definition from the Commission Staff."

Finding 3-4: DSL data speed line testing indicates VPA's assumption that loop length is the sole determinant of broadband availability for NMP reporting purposes is inaccurate.

For NMP reporting purposes, VPA assumes that all loops inventoried with lengths below 12 kft in Verizon's Golden Source database are broadband capable and no loops above 12 kft are broadband capable.[288] To test this assumption, Liberty requested that Verizon measure a sample of working DSL lines to determine the maximum data speeds these lines were capable of delivering. To select the sample for this test, Liberty obtained from Verizon a list of all working DSL lines in the VPA service territory, grouped them into 11 strata by loop length as inventoried in the Golden Source database, and drew random samples from each strata.[289]

[287] Response to Preliminary Finding #36.
[288] Interview #2, September 11, 2007 and response to Data Request #141.
[289] Response to Data Request #295.

The table below provides the results of the Verizon measurements for the lines in the Liberty sample. The two bold-faced lines, indicating the totals of lines below and above 12 kft, are results weighted according to the total number of DSL lines in the population. The analysis of lines with a loop length less than or equal to 12 kft showed that 4 percent could not support broadband data speeds even though VPA assumes all these lines can support broadband. The analysis of lines with a loop length above 12 kft showed that 70 percent could support broadband data speeds even though VPA assumes that none of them can support broadband.

Table 3-9

Summary of Results from Broadband Capability Testing on a Random Sample of DSL Lines

(Begin Proprietary)

				[290]
				[291]

(End Proprietary)

As indicated by the column showing the percentage of lines that are broadband capable, broadband capability drops with loop length. However, 12 kft is not a logical cut-off, because most lines with loop lengths greater than 12 kft still support broadband and a small percentage of lines with loop lengths shorter than 12 kft do not support broadband. Overall, VPA appears to be

[290] **(Begin Proprietary)**

(End Proprietary)

[291] **(Begin Proprietary)**

(End Proprietary)

currently underestimating the number of lines capable of broadband by using loop length to determine this capability.

On the other hand, it is likely that in order to meet its future NMP commitments, VPA will need to deploy DSL-capable remote terminal equipment that reduces loop lengths to 12 kft or less. When this occurs, the results of the Liberty test sample indicate that VPA would eventually be overestimating its broadband availability by assuming that all lines less than 12 kft are broadband capable. According to the results of the Liberty test, approximately four percent of these lines will still not be able to provide broadband service.[292]

In response, Verizon indicated that it agrees with Liberty with respect to the assumption that only those lines associated with loops less than or equal to 12 kft are capable of providing DSL at broadband speeds results in an understatement of VPA's level of broadband availability reported in its Sixth Biennial Update. However, Verizon does not agree that it should not count 100 percent of the loops that are 12 kft or less as being capable of broadband data speeds. Verizon bases its disagreement on its interpretation of a September 17, 2003, Commission order at Docket No. P-00930715F0002, stating that this order established the fixed loop measurement of 12 kft as the point where the Commission would presume that DSL could be provided at broadband speeds. Additionally, Verizon indicated that Liberty assumes there will be no improvements in DSL technology and that DSL is the only technology that VPA will use to fulfill its NMP obligations.[293]

Despite Verizon's objections, the evidence from Liberty's circuit testing and Verizon's own field tests clearly indicates that not all loops less than 12 kft in length are capable of supporting DSL service at broadband data speeds. Additionally, Verizon alluded to improvements in DSL technology and new technologies such as FTTP that VPA will be deploying to meet its commitments. However, that fact remains that unless and until VPA deploys these DSL technology improvements and new technologies in its network, VPA's current process for determining broadband availability does not produce accurate results.

There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-6 in the Task Areas 1 and 2 chapter: "Implement a revised broadband availability identification process that more accurately represents Verizon's ability to support broadband DSL service in its network."

Finding 3-5: Verizon's Golden Source database, which it used to report broadband availability in the VPA Sixth Biennial Update, does not always reflect the most accurate loop-length information available to Verizon.

To validate the accuracy of Verizon's Golden Source database, Liberty requested that Verizon perform circuit tests on a random sample of working POTS and DSL lines identified by Liberty.

[292] Liberty's test results are supported by a similar test conducted by Verizon in 2003 (see response to Preliminary Finding #12).
[293] Response to Preliminary Finding #39.

Liberty requested Celerity attenuation (line loss) and Celerity electronic distance measurement (loop length) tests for those lines served by central offices that had Celerity testing capability, and MLT electronic distance measurement for all lines in the sample.[294] Liberty then compared the results obtained from these tests with the loop lengths inventoried in Golden Source for the sampled lines.[295] Liberty identified some discrepancies between the loop length determined by the test results and the loop lengths inventoried in Verizon's Golden Source database. Based on Verizon's responses to Liberty's inquiries about these discrepancies, Liberty identified the following problems with the loop-length data populated in Verizon's Golden Source database:[296]

- Verizon does not replace manually populated Golden Source data when Celerity testing containing more current and more accurate loop information becomes available. According to Verizon's process for updating its Golden Source loop-length data, manual entry takes the highest priority over all other data sources. Once a Verizon engineer or other user manually populates a loop-length entry in Golden Source, the manual entry will supersede all other data inputs. As a result, this process allows data manually entered years ago based on loop-length estimates (terminal loop length) or on unknown data sources to override more current and accurate data obtained from Celerity attenuation testing.[297]
- Some PARTS lines are not properly designated. Liberty found an instance of a PARTS line updated in Golden Source based on LFACS data that did not contain the PARTS indicator flag. PARTS lines should be identified in the Golden Source database with a loop length of zero and a PARTS service flag.[298]
- Verizon either does not complete line testing with Celerity, when such testing is available, or its automated process to update Golden Source with Celerity test results does not function properly. Verizon's Golden Source database is designed to be updated mechanically from the Celerity Test System Controller upon the completion of a Celerity test.[299] Verizon places lines that do not achieve a successful test in a "telephone numbers to be tested" queue where they will remain until Verizon obtains a successful test result. Verizon has indicated that it will attempt to retest these lines every 24 to 48 hours.[300] However, Liberty's test results showed that this process does not appear to be working as designed with

[294] In response to Data Request #118, Verizon indicates that it has Celerity testing capability in only 103 of its central offices; also, response to Data Request #290.
[295] Liberty provided VPA with a sample of 1,000 POTS and DSL lines to be tested. From this sample, VPA returned 182 Celerity attenuation test results, 324 Celerity loop length results and 467 MLT loop length results for analysis. These results are not mutually exclusive; the VPA tests produced all three test results for many lines and no test results for other lines. In response to Data Request #264, VPA explained that test results are not always available due to a number of factors, including but not limited to, subscriber busy, test port problem, and a fault on the line. Additionally, lines provisioned for DSL service will return Celerity loop length results but, due to the splitter on the line, cannot return an attenuation reading.
[296] Liberty initially inquired about the discrepancies it observed in Data Requests #324 through #326. Liberty issued follow-up Data Requests #330 through #337 for clarification of VPA's responses to Liberty's initial data requests.
[297] Responses to Data Requests #330 and #335.
[298] Responses to Data Requests #220 and #332.
[299] Responses to Data Requests #270 and #289.
[300] Response to Data Request #279.

lines having valid Celerity attenuation results not inventoried properly in the Golden Source database to reflect these test results.[301]

VPA uses the loop lengths inventoried in Golden Source for reporting broadband service availability at data speeds of 1.544 Mbps or greater and for reporting DSL service availability at data speeds less that 1.544 Mbps in its NMP Biennial Updates. By using incorrect and/or outdated loop length information in Golden Source, VPA does not report accurate broadband/DSL availability results in its Biennial Updates.[302]

In response, Verizon indicated that it disagreed with Liberty's finding that the Golden Source database does not always reflect the most accurate loop-length information available to Verizon. Verizon stated that it has a rigorous process for updating Golden Source with Celerity or MLT loop length data for lines lacking a manual entry in the system. For loop lengths that were manually entered, Verizon indicated that its engineering personnel "regularly review qualified and unqualified TN's to find inaccurate manual loop lengths or erroneous records associated with PARTS and Overlay qualified TN's. Errors that are found in the Golden Source database are corrected." Verizon concluded its response by stating, "[d]espite Verizon's best efforts, its database of approximately five million working TN's is not perfect."

There is no independent recommendation resulting from this finding. The finding provides further support for Recommendation 1-6 in the Task Areas 1 and 2 chapter: "Implement a revised broadband availability identification process that more accurately represents Verizon's ability to support broadband DSL service in its network."

[301] Responses to Data Requests #331 and #336.

[302] Liberty also issued Findings 1-6 and 3-4 explaining that VPA's assumption that loop length can be used as the sole determinant of broadband/DSL availability is inaccurate.

IV. Task Area 4: Financial Records and Accounting Methods

A. Purpose and Background

The original scope of this task area included the following items from the Commission's RFP:

1. A reconciliation of VPA supporting financial information with reported results in the VPA Sixth Biennial Update (RFP item 9),
2. A verification that actual investment amounts reported in the Sixth Biennial Update reconcile with the general ledger and other internal accounting data (RFP item 11), and
3. A review of depreciation study procedures and reconciliation of booked depreciation with that reported in the Sixth Biennial Update (RFP item 12).

The Commission Staff issued a memo entitled "Verizon Network Modernization Plan Audit Scope Clarification, Docket No. D-06SPA022" on September 6, 2007. This memo noted that VPA is no longer required to provide depreciation information in the biennial updates. Therefore, in this audit, "the depreciation information reported by Verizon in its biennial NMP status report should only be used to the extent necessary to aid in verification of the amount of capital investment which was made to deploy broadband services and modernize Verizon's network." Liberty limited its originally planned analysis in this task area accordingly.

B. Analysis

Reconciliation of VPA Supporting Financial Information with Reported Results

As part of its reconciliation of VPA's supporting financial information with reported results in the Sixth Biennial Update, Liberty reviewed the high-level process flow and business rules for the reporting of the 2005 and 2006 capital investments in the VPA Sixth Biennial Update.[303] Liberty also reviewed the supporting documentation, reporting systems, and databases provided by VPA. VPA explained that it pulls the capital investment results from the Verizon Financial Reporting and Analysis Management Environment (VFRAME), a financial management reporting system that receives data feeds from the East and West[304] general ledgers and project costing systems.[305] VPA's project costing system captures and accumulates capital expenditure costs by specific budget codes and project identifiers.[306] This system also stores the budget codes

[303] Responses to Data Requests #24 and #28.
[304] Interview #6, September 20, 2007. The East general ledger and project costing system contain information for the former Bell Atlantic states, including Verizon Pennsylvania, Inc (VPA), while the West general ledger and project costing system contain information for the former GTE territory.
[305] Responses to Data Requests #45 and #63.
[306] Responses to Data Requests #50 and #61.

and project identifiers for "Chapter 30," "DSL," "FTTP," and "IntelliLight" investment categories.[307] Corporate initiatives form the basis for the latter three categories, which refer to DSL, FTTP, and IntelliLight. Pennsylvania-only initiatives form the basis for the Chapter 30 investment category, which captures capital investments for the deployment of the broadband network, including DSL, FTTP and IntelliLight investments.[308] Liberty reviewed and verified a sample of the budget codes and project identifiers and found that VPA reported them accurately within the various investment categories. Liberty also found the process flow, business rules, supporting documentation, and reporting systems to be adequate.

Liberty conducted interviews to understand better the accounting and engineering personnel's crossover roles and functions in the development and reporting of the capital expenditures (CAPEX) in the VPA Sixth Biennial Update.[309] VPA personnel provided overviews of the VFRAME reporting system and database, explained how feeder systems, such as Accounts Payable and Labor Reporting systems flow and integrate into VFRAME, and how data within the database is extracted from VFRAME and reported in the Sixth Biennial Update. The VFRAME system holds capital data, both actual and budget, for all the former Bell Atlantic (which includes VPA) and GTE territories. Detailed transaction data from sub-systems, such as accounts payable, labor, and time reporting systems, feed directly into the general ledger and project costing system. Once VPA completes and closes the general ledgers and the project costing ledgers for a reporting period, the general ledger and project-costing module passes the data file directly to VFRAME for reporting purposes. The data residing in VFRAME contains unique identifiers that allow for various levels of reporting such as state, management entity, and budget code level reporting. Liberty also reviewed the process for the establishment of budget codes for capital expenditures, variations in capital expenditure terminology (*i.e.,* capital investments, capital additions, capital expenditures, net vs. gross capital expenditures, etc.), and the project ledgers that capture detailed CAPEX activity. Verizon stated that its engineers are the sole owners of capital projects and they determine the capital projects that VPA will include in NMP reporting. VPA uses the budget codes as the basic identifiers of capital costs and specifies a set of these unique budget codes for inclusion in the NMP reporting. The finance organization determines and sets the unique budget code on request from a program/budget manager within the network-engineering department. The network or finance capital manager must approve the request for a budget code. The budget codes reside in the project-costing module to accept charges from various feeder systems as described above.

Liberty reviewed VPA's internal capitalization accounting policies and criteria for adequacy and to determine whether they complied with the Federal Communication Commission (FCC) Rules and Regulations. Liberty confirmed that Verizon uses the same capitalization policies across all the Verizon reporting companies. Because Verizon applies the capitalization policies to all Verizon reporting requirements, its capitalization policies are inherent in VPA's Sixth Biennial Update.[310] Liberty selected a representative sample of several plant investment accounts, budget

[307] Responses to Data Requests #50, #61, and #63. IntelliLight refers to interoffice network investment using the Synchronous Optical Network (SONET) ring technology.
[308] Response to Data Request #188.
[309] Interview #6, September 20, 2007, and responses to Data Requests #23, #24, #47, #188, #189, and #190.
[310] Response to Data Request #49.

codes, and project identifiers, used as part of the report's supporting documents, to verify that VPA complied with its capitalization accounting policies. Specifically, Liberty reviewed VPA's reporting of its Telephone Plant In Service (TPIS) and Telephone Plant Under Construction (TPUC) within the selected plant investment accounts, budget codes, and project identifiers detail.[311] Liberty reviewed the capitalization policies to ensure they complied with the FCC's Part 32, Uniform System of Accounts for Telecommunications Companies, and FCC Docket 95-60. This docket increased the expense limit for certain plant accounts from $500 to $2,000. The $2,000 expense limit is a threshold for certain accounts that determines if certain costs should be capitalized or recorded as expense.[312] Liberty used the FCC Part 32 Chart of Accounts, the cost of construction instructions,[313] and the $2,000 expense limit threshold to verify that VPA recorded the cost of construction correctly and to the proper plant accounts. Liberty found the company capitalization policies to be adequate and compliant with FCC accounting rules and regulations. As part of the TPIS and TPUC analysis, Liberty reviewed and verified VPA's work order closing process and procedures to confirm whether VPA closed a work order (either partially or totally closed) to TPIS.[314] Liberty found that VPA's work order closing process and criteria (*i.e.,* determination that a work order is partially completed and closed to TPIS) to be in accordance with its closing process.

Liberty verified that the plant investment accounts used for the NMP CAPEX accounting, agreed with the FCC's and VPA's internal chart of accounts.[315] After determining that the plant investment accounts were correct, Liberty reconciled the 2004 and 2005 Plant In Service (PIS) investments by account, as presented in Attachment B – 2007 Depreciation Report, of VPA's Sixth Biennial Update, to VPA's supporting worksheets and files.[316] Liberty used the PIS investments in the depreciation information reported by Verizon to verify the amount of capital investment VPA made to deploy broadband services and modernize VPA's network. Liberty found that the plant investment amounts included in Attachment B represent the total regulated VPA plant investments, which includes the plant investment amounts as reported in VPA's Sixth Biennial Update.[317] Liberty noted items that did not reconcile between the plant investments listed in the Sixth Biennial Update's Attachment B and VPA's supporting worksheets. However, Liberty found that these items are related to non-regulated activity, and therefore VPA did not include them in the Sixth Biennial Update.[318] Liberty confirmed that the 2004 and 2005 TPIS investment accounts are correct as reported in Attachment B – 2007 Depreciation Report.

[311] Response to Data Request #111.
[312] FCC Docket 95-60 on $2,000 Expense Limit, Dated May 30, 1997. Response to Data Request #49.
[313] FCC 47 CFR-Part 32 Section 32.2000 – Instructions for telecommunications plant accounts. Response to Data Request #49.
[314] Responses to Data Requests #190 and #191.
[315] Response to Data Request #58.
[316] Response to Data Request #45. As noted above, Liberty did not perform an audit or review of the depreciation criteria included in Attachment B based on Commission Staff memo, dated September 6, 2007, "Verizon Network Modernization Plan Audit Scope Clarification, Docket No. D-06SPA022."
[317] Response to Data Request #46.
[318] VPA only reports regulated activity in the Biennial Updates.

Liberty reviewed VPA's reporting of capital expenditures in the Sixth Biennial Update for consistency and clarity. Liberty noted two concerns with Verizon's reporting of capital expenditures. These concerns are described in Findings 4-1 and 4-2 below.

Liberty reviewed VPA's supporting worksheets and files to determine how VPA captures CAPEX for the recording and reporting of data in the VPA biennial updates. Liberty found that Verizon overstated the 2006 FTTP capital expenditures in its Sixth Biennial Update. This matter is described in Finding 4-3 below.

Verification that Reported Investment Amounts Reconcile with Internal Accounting Data

Liberty also verified that the actual investment amounts reported in the Sixth Biennial Update reconciled with the general ledger and other internal accounting data. Liberty selected a representative sample of Budget Codes and Project identifiers from the files provided by VPA[319] and reconciled the CAPEX to VPA's Summary and Detail Project Ledger Reports. The reconciliation of the selected Budget Codes and Project identifiers to the Summary Project Ledger Report included a breakdown and analysis of the capital expenditures categorized as Cost Type 1 (TPIS), Cost Type 3 (telephone plant under construction), Allowance for Funds Used During Construction (AFUDC), and reused equipment charges.[320] Liberty also verified charges by location. Based on the reconciliation and analysis of the selected budget codes, Liberty found that VPA accurately recorded and reported the actual investment amounts in the Summary and Detail Project Ledger Reports which support the Sixth Biennial Update.

Liberty performed additional testing and verification on a sample basis to ensure that VPA included AFUDC and reused equipment when it records capital expenditures as TPUC.[321] In addition, for projects completed and closed (partial or in total), Liberty verified that VPA reduced the project ledger for costs ultimately transferred to TPIS, *i.e.*, VPA would include a credit (reduction) to the Project Ledger Report – Summary. Liberty found VPA's project closing to be adequate.

Liberty reconciled the 2004 and 2005 PIS investment by account, as reported in Attachment B – 2007 Depreciation Report, to VPA's 2004 and 2005 general ledger, the FCC ARMIS Report and PAPUC Annual Reports.[322] Liberty found that VPA properly reported the 2004 and 2005 PIS investments in its Sixth Biennial Update, and did not find any reconciliation issues.

Liberty performed verification and reconciliation of VPA's reported capital investment for the years 1994 through 2006 as presented in the graphical chart, "Cumulative Verizon PA Capital Additions," on page 26 of the VPA Sixth Biennial Update. Liberty performed this reconciliation

[319] Responses to Data Requests #50, #51, #52, #53, #54, #55, and #61.
[320] Responses to Data Requests #50, #60, #110, and #111.
[321] Responses to Data Requests #109 and #192.
[322] Responses to Data Requests #48 and #59.

to confirm whether Verizon's documentation supported the historical annual and cumulative investment dollars reported in the Sixth Biennial Update. Liberty also reviewed the chart to determine the validity of the reported information. Based on the review and reconciliation results, Liberty found the supporting documentation adequate and was able to reconcile it to the Sixth Biennial Update. Liberty notes that VPA does not have system-generated reports for its capital additions from 1994 through 1997 as provided for other years. Instead, these reports are taken from spreadsheets compiled by VPA personnel.[323].

C. Findings and Recommendations

Liberty determined that most of the financial data VPA reported in the Sixth Biennial Update is accurate. However, Liberty's audit uncovered some concerns noted in the following three findings.

Finding 4-1: Verizon did not adequately define or consistently report capital broadband investment in the VPA Sixth Biennial Update, dated July 2, 2007.

In the VPA Sixth Biennial Update, Verizon uses various terms in reporting its level of capital investment in Pennsylvania: "investments," "capital expenditures," "capital investment," "investment expenditures," "gross capital expenditures," and "capital additions." Moreover, Verizon does not adequately define or distinguish these terms and appears to use them largely interchangeably. However, Liberty found that the reported numbers often represent different and inconsistent quantities.

Item 8 of the Commission's Chapter 30 Biennial Update Reporting Guidelines for Local Exchange Carriers states that "the biennial updates should provide the level of investment being made to develop the *broadband* network" [emphasis added].[324] However, Liberty found that instead of consistently reporting *broadband* investment in the Sixth Biennial Update, VPA sometimes reported capital expenditures as total Pennsylvania expenditures and sometimes as broadband expenditures only.[325] In all cases Verizon simply referred to the numbers as "capital" expenditures, additions, or investments, without distinguishing the differences in their actual composition.

In addition, numbers quoted for Chapter 30, DSL, FTTP, and IntelliLight categories on pages 24 and 25 of the Sixth Biennial Update report net capital expenditures, which excludes non-cash items. However, in the graph on page 26, which Verizon labels "Cumulative Verizon PA Capital Additions," Verizon shows gross capital expenditures, which includes non-cash items. Verizon's

[323] Responses to Data Requests #189, #224, and #226.

[324] Chapter 30 Biennial Update Reporting Guidelines for Local Exchange Carriers, from Commission Order at Docket M-00930441 entered May 17, 1999. This document was revised pursuant to Final Rulemaking Order at L-00050176 entered August 21, 2006, and the revision includes lines drawn through item 8. However, for the Sixth Biennial Update, which reports VPA's progress in meeting its NMP commitments during 2005 and 2006, VPA still quoted and apparently intended to comply with item 8 of the Reporting Guidelines.

[325] Responses to Data Requests #185, #186, and #187.

confusing and inconsistent reporting of capital expenditures in the Sixth Biennial Update does not provide a clear picture of its actual broadband investments in Pennsylvania.

In reply to Liberty's finding, Verizon noted that it is not required by statute or the VPA NMP to expend a particular level of capital or to expend capital for specific purposes.[326] Verizon contended that the reporting of capital investments required by the Commission in the biennial updates "is at best only helpful background information and is not a decisive issue in determining Verizon's compliance with statutory or plan commitments." Verizon noted that the Commission's reporting guidelines do not require specific definitions of capital investment categories, and therefore Verizon's reporting in the Sixth Biennial Update is "not inconsistent" with the Commission's reporting requirements. Furthermore, Verizon states that Act 183 prohibits the Commission from increasing the biennial update reporting requirements and that the Commission directed Staff to "streamline" these requirements. Verizon also contended that its reporting is reasonable and consistent with financial reporting practices, and notes that it complied with Liberty's requests for backup information explaining the reported investments.

Recommendation 4-1: Report the composition of capital expenditures consistently in the VPA biennial updates and explicitly label the types of capital expenditures reported.

To avoid confusion in future biennial updates, Verizon should be careful to use consistent terms and define the terms it uses. Verizon should describe capital expenditures reported in the biennial updates in more detail and explicitly and consistently label the capital expenditures reported. For example, Verizon could use the term "cash capital expenditures" when reporting net capital expenditures and "gross capital expenditures" when reporting gross numbers. When Verizon reports total capital expenditures for all of Pennsylvania, it should note that. When Verizon reports capital expenditures solely for broadband, then it should describe those as broadband only. A definition in a footnote or within the body of the report would be adequate and would reduce the likelihood of misinterpreting the reported CAPEX dollars. Despite Verizon's contention, these suggestions should not constitute an "increase in reporting requirements," but merely clarification of what is currently reported.

Finding 4-2: In the VPA Sixth Biennial Update, dated July 2, 2007, Verizon reported capital investment in categories that do not allow a determination of the total Pennsylvania investment by network technology.

In the VPA Sixth Biennial Update, Verizon reported capital investment in the following categories: "Chapter 30," "DSL," "FTTP," and "SONET ring IntelliLight facilities." Verizon further defines the Chapter 30 investments as including "placement of fiber in the interoffice, feeder and distribution networks, construction of Remote Terminals (RTs) and placement of NGDLC systems in conjunction with the installation of DSL equipment in those RTs."[327]

[326] Response to Preliminary Finding #28.
[327] VPA Sixth Biennial Update, pp. 24-25.

During this audit, Verizon informed Liberty that the Chapter 30 category includes DSL, FTTP, and IntelliLight capital expenditures that are based on *local* network modernization initiatives (*i.e.*, initiatives specific to Pennsylvania only).[328] On the other hand, the DSL, FTTP, and IntelliLight categories are composed of expenditures based on the Pennsylvania portion of *corporate* network modernization initiatives, (*i.e.*, capital expenditures for and across the entire Verizon footprint, which includes other Verizon states).[329] None of the reported numbers represent total DSL, FTTP, or IntelliLight investments resulting from both local and corporate initiatives. Verizon also did not provide in the Sixth Biennial Update any information on what portion of the Chapter 30 local initiatives represent investments in the different DSL, FTTP, or IntelliLight network technologies.

Because Verizon aggregates the local initiatives for DSL, FTTP, and IntelliLight expenditures together into the Chapter 30 category, and then separately reports the corporate initiatives for DSL, FTTP, and IntelliLight from the Chapter 30 category, the expenditures reported in the VPA Sixth Biennial Update do not show the total DSL, FTTP, and IntelliLight expenditures for Pennsylvania.

Verizon replied to Liberty's finding with the same points as those in response to Finding 4-1 (Preliminary Finding #28).[330] In particular, Verizon stressed that it is not required to report total Pennsylvania investment by network technology.

> **Recommendation 4-2: Work with the Commission Staff to achieve agreement on the categories of capital investment to be reported in future biennial updates.**

The current Reporting Guidelines contain the following requirement:

> *The biennial updates should provide the level of capital investment being made to develop the broadband network. Specifically, information regarding the historical, current, and projected levels of capital investment in the network should be provided.*[331]

Although VPA has noted that "there is no level of capital investment required or committed to in its NMP or any Commission order or in Act 183,"[332] it has chosen to report the capital investment in categories that are confusing and potentially misleading. Therefore, it would be

[328] Response to Data Request #188.
[329] Response to Data Request #188.
[330] Response to Preliminary Finding #29.
[331] "Chapter 30 Biennial Update Reporting Guidelines for Local Exchange Carriers," item 8. The Commission Staff originally published the Reporting Guidelines pursuant to Commission Order at Docket M-00930441 entered May 17, 1999. In accordance with Act 183 of 2004, the Commission modified the reporting requirements in the Final Rulemaking Order at L-00051076, and the Staff published a modification of the Reporting Guidelines on the Commission's website. The Staff informed Liberty that this modification inadvertently included strike-outs through the entirety of items 8 and 9 of the 13 items in the Guidelines. This quotation contains the appropriate modified wording for item 8.
[332] Response to Preliminary Finding #2 (Revised). See also responses to Preliminary Findings #28 and #29.

helpful for Verizon to work with Commission Staff to obtain agreement on the investment categories that should be reported in the biennial updates.

Liberty recommends that VPA report the total capital investments by broadband technology (DSL, FTTP, and IntelliLight). Liberty does not believe that this recommendation would represent an increase in reporting requirements, as Verizon contends, but would serve to clarify what VPA is already reporting. Verizon's current reporting may mislead the reader to think that the expenditures reported as "DSL," "FTTP," and "IntelliLight" are the only capital expenditures for those categories. In fact, these reporting categories only include expenditures based on corporate initiatives. If Verizon wants to report capital expenditures separately by local and corporate initiatives, it might do so through a footnote or through additional details and description of the capital expenditures.

Finding 4-3: Verizon overstated the 2006 FTTP capital expenditures in its VPA Sixth Biennial Update.

In the VPA Sixth Biennial Update dated July 2, 2007, Verizon overstated the FTTP capital expenditures for 2006 by $57 million.[333] Liberty found two errors in Verizon's supporting documentation to its Sixth Biennial Update. The first, a spreadsheet error, resulted in an overstatement of $60 million.[334] The second error resulted from a FTTP budget code mapping error within Verizon's budget code support detail that produced a $3 million understatement. The net effect of correcting the two errors was an overstatement of $57 million for the FTTP capital expenditures for 2006.

Verizon corrected the spreadsheet error for the $60 million FTTP overstatement and amended the Sixth Biennial Update for the 2006 FTTP capital expenditures from **(Begin Proprietary) (End Proprietary)**.[335] Verizon also provided corrected supporting documentation for the budget code mapping error of $3 million, and subsequently amended the Sixth Biennial Update to reflect the increase to the 2006 FTTP capital expenditures, from **(Begin Proprietary) (End Proprietary)**.[336]

Recommendation 4-3: Review internal controls, validation of work documents, and staffing to ensure accurate reporting of the financial data in VPA's biennial updates.

Due to the magnitude of projects to be managed and reported within the NMP, Liberty recommends that the Verizon Capital Investment and Asset Management groups review the process of assigning, managing, and reporting of budget codes and project identifiers to ensure that VPA adheres to process flows and controls. In addition, VPA should review the staffing and

[333] Responses to Data Requests #113 and #114, and the VPA Sixth Biennial Update, page 25.
[334] Responses to Data Requests #45, #50, and #114; and response to Preliminary Finding #2.
[335] September 17, 2007 Verizon filed amended pages to the VPA Sixth Biennial Update under Chapter 30 and Act 183.
[336] Response to Data Request #113 and April 22, 2008 filing to amend the Sixth Biennial Update.

personnel responsible for verification of Budget Codes specifically assigned to the NMP effort to determine whether it has adequate resources to review and verify the data in the biennial updates.

V. Task Area 5: Capital Budgeting

A. Purpose and Background

In this task area, Liberty analyzed VPA's capital budget and the capital budget information provided in the VPA Sixth Biennial Update. The scope derived from the following tasks listed in the Commission's RFP:

1. Verification, on a test basis, that projected capital investment provided in the Sixth Biennial Update reconciles with amounts in the approved or authorized short- and long-term capital budgets (RFP item 11),
2. Verification that the details of present and projected upgrades to switches, fiber deployment, intelligent signaling, and ISDN availability reconcile with items in the approved capital budget and/or other available supporting or authorizing information (RFP item 15), and
3. Determination that VPA is on-track with its projections (RFP item 15).

In particular,

- Liberty reviewed and analyzed VPA's network planning and funding process for consistency with the objectives of the VPA NMP. Liberty addressed the question of whether VPA's network planning and funding provide the necessary framework for it to plan and construct a ubiquitous broadband network for Pennsylvania as required by the NMP.
- Liberty analyzed the capital budgeting process to determine how VPA established priorities in the budgeting process and the role of VPA personnel in that process.
- Liberty analyzed the capital budget information provided in the report. To the extent possible, Liberty examined the capital budget over the Sixth Biennial Update period (2005-2006) to determine trends and to analyze specific categories of changes.

B. Analysis

Network Planning

In April 2003, Verizon's network planning organization issued Interim PA Chapter 30 Funding Direction Guidelines for the former Bell Atlantic (fBA) regions of Verizon Pennsylvania.[337] The purpose of these Chapter 30 Guidelines was to provide interim direction on how to use the funding available to meet VPA's NMP commitments. The Guidelines addressed the funding of new broadband requirements that resulted from negotiations with the Commission. VPA was to use the funding for:

- Placement of new remote terminals for access lines greater than 12,000 feet from the central office.

[337] Response to Data Request #10.

- Placement of remote terminals to serve new housing and office developments, in lieu of using existing spare facilities at distances greater than 12,000 ft from the central office.
- Placement of fiber in new interoffice facilities and feeder relief jobs to support the requirement to have spare fibers at all remote terminal locations.
- Placement of additional HDSL electronics or spare NGDLC Digital Signaling Level 1 (DS1) cards in remote terminals to support the requirement to have "hot spare" capacity to provide short-term 1.544 Mbps service.[338]

Although VPA considered the Chapter 30 Guidelines as temporary, it continues to use them for funding in Pennsylvania.

In addition to the Chapter 30 funding items listed above, there are three other budget categories that are relevant to the NMP. These categories are "DSL," "FTTP," and "SONET/IntelliLight." The DSL category includes all corporate initiatives associated with the placement of DSL for high-speed internet access. This category includes funding associated with other network equipment used to provide DSL service, including any inter-office facilities or switching equipment required for the DSL network. The FTTP category contains funding associated with the deployment of Verizon's FTTP service. The SONET/IntelliLight category contains funding for equipment used for high-speed data products (Asynchronous Transfer Mode or ATM).

Liberty reviewed VPA's network planning and funding process to ensure that it is consistent with the NMP. Verizon conducts network planning from both a top-down and bottom-up perspective. Verizon's network planning and network architecture practices and procedures identify the technologies and provide the guidelines for the engineering, planning, and construction of the network. The Verizon Network Planning organization provides Network Guidelines to its network engineers and planners for use in designing, maintaining, and constructing the local network.[339] The Network Guidelines provide a technical foundation for the development of Area Network Plans (ANPs). ANPs are the official planning and budgeting document used by VPA.[340] They document the outside plant capital investment requirements, expense, and workforce needed to meet network target deliverables for the calendar year. VPA's planning and funding guidelines are complete and VPA follows them. The ANPs define a process that is adequate to allow Verizon to meet its NMP commitments if it provides sufficient funding.

Liberty interviewed Verizon engineering and capital budgeting personnel to understand the role of network planning in developing the capital budget. Liberty issued and analyzed responses to data requests to understand the role of the planning engineers in establishing network construction priorities. The Manager for Outside Plant is responsible for monitoring capital budgets to ensure that VPA meets its interim NMP commitments and is on target to meet its

[338] Response to Data Request #10, Interim PA Chapter 30 Funding Direction Guidelines for the fBA regions of Verizon Pennsylvania, pp. 4-5.
[339] Response to Data Request #86.
[340] Response to Data Request #86, Loop Application Guidelines, p. 5.

2015 commitments.[341] This manager ties together the planning and engineering functions with the financial constraints and requirements. The Verizon engineers design the plant facilities and the planners are responsible for providing estimates of the plant costs. The manager works with outside plant engineers and planners to ensure that they complete the appropriate economic studies and that the capital budget considers the results of those studies.

In 1999, VPA's Network Planning organization provided an overview of the target architecture for the future. This architecture consists of a fast-packet switching network, high-speed interconnections, high-bandwidth access, a distributed control system using a ring architecture, and integrated voice and data services. In the local loop, Verizon indicated it would rely on overlay technology (DSL) on its embedded loop architecture for achieving high-bandwidth services. Verizon also indicated that it intended to deploy fiber deeper into the loop plant to achieve quality of service improvements, reduced maintenance and provisioning costs, and to increase bandwidth capability by shortening the length of the copper facility to the premises.[342]

Verizon provided Liberty with information on its deployment plans during the period reported in the VPA Sixth Biennial Update.[343] Liberty found that the data VPA reported in the Sixth Biennial Update is consistent with these plans. VPA reported that it plans to meet its future broadband availability commitments by deploying fiber (or comparable technology) and broadband equipment deeper into the Pennsylvania distribution network. VPA will either equip existing remote terminals with broadband service equipment or will deploy new DSL-capable remote terminals as required. VPA also indicated that it plans to continue to expand its FTTP service rollout. Liberty reviewed a summary of the equipment deployment projects that VPA identified as required to meet its 2008 NMP requirements and to expand its broadband footprint. Liberty found that VPA had deployment projects scheduled for 2007 and 2008 to make additional rural and suburban central offices DSL capable as well as to expand its deployment of fiber facilities and DSL-capable remote terminals.[344]

As noted in the Task Areas 1 and 2 chapter of this report, two of the methods Verizon uses to provide DSL involve placing DSLAMs in or near remote terminals in order to reduce the copper portion of the loop length to the customers. In the Third Supplement to the VPA NMP, Verizon committed that all new remote terminals would be fiber-fed or fed with a comparable technology to meet the obligation of the NMP. In addition, VPA committed to deploying additional remote terminals and related equipment throughout its territory where none currently exist in order to reduce the copper portion of the loop so that it can provide broadband services at speeds of at least 1.544 Mpbs to customers residing at distances greater than 12,000 feet from the central office. This commitment was set forth with a timetable in the Third Supplement to the NMP. In that supplement, VPA also stated that if technologies making higher broadband speeds available over longer loops or using other technologies were to become available, VPA would modify its plan accordingly, subject to Commission review. VPA also committed to continue the

[341] Interview #9, October 26, 2007.
[342] Response to Data Request #86.
[343] Response to Data Request #249.
[344] Responses to Data Requests #257 and #260.

deployment and upgrading of remote terminals to achieve the 100 percent broadband availability commitment by 2015.[345]

In its Sixth Biennial Update, VPA reported that it plans to meet its future broadband availability commitments by deploying fiber (or comparable technology) and broadband equipment deeper into the Pennsylvania distribution network. VPA will either equip existing remote terminals with broadband service equipment or will deploy new DSL-capable remote terminals as required. VPA indicated that it will install DSL equipment in the remaining **(Begin Proprietary) (End Proprietary)** Pennsylvania central offices not DSL-capable at year-end 2006.[346] VPA also indicated that it plans to continue to expand its FTTP service rollout. VPA stated that construction of the FTTP network is in various stages of completion in 74 wire centers in Pennsylvania. By late 2007, this number had expanded to 81 wire centers.[347]

The following table shows, for each of the three Verizon DSL technologies and for FTTP in rural areas, the broadband capable access lines based on the data used by VPA in its Sixth Biennial Update.[348]

Table 5-1

Access Lines by Broadband Technology

Technology	**Access Lines (Year-End 2006)**
Existing PARTS Broadband	**(Begin Proprietary)**
Existing Overlay Broadband	
Existing CO-based DSL Broadband	
Existing FTTP (Rural Only)	
Total DSL and Rural FTTP	**(End Proprietary)**
Total VPA Access Lines	4,481,739

To achieve 100 percent broadband availability by 2015 (without the introduction of a new technology), VPA must make all of its remaining central offices DSL capable as well as deploy additional PARTS DSL, Overlay DSL, or FTTP for approximately one-third of the access lines that are not yet broadband-capable.[349] In addition, VPA has **(Begin Proprietary) (End Proprietary)** remote terminals installed in its network but only **(Begin Proprietary) (End Proprietary)** percent are equipped for broadband services.[350] These additional requirements represent both a significant capital investment and labor commitment.

[345] Third Supplement to the VPA NMP, p. 1 and VPA Biennial Update, pp. 7-8.
[346] VPA Sixth Biennial Update pp. 21-23 and response to Data Request #95.
[347] Responses to Data Requests #248 (revised) and #339.
[348] Response to Data Request #179. Table 5-1 only shows FTTP in the ten rural exchanges with this capability, consistent with Verizon's reporting in the VPA Sixth Biennial Update. Liberty discusses this issue in the Task Areas 1 and 2 Report.
[349] Table 5-1 does not show the impact FTTP in suburban and urban areas, but this impact should be minimal, because in those areas DSL is usually available at the same locations as FTTP. Similarly, it does not show the small impact of DS-1.
[350] Response to Data Requests #15 and Staff Data Request 1.2.

The 2007 broadband deployment plans are to equip **(Begin Proprietary) (End Proprietary)** existing rural remote terminals for DSL and construct **(Begin Proprietary) (End Proprietary)** new fiber-fed remote terminals in rural areas equipped for both DSL and T1 deployment. This plan will result in an estimated **(Begin Proprietary) (End Proprietary)** rural lines with broadband capabilities.[351] Following the 2007 deployment, there will remain approximately **(Begin Proprietary) (End Proprietary)** rural lines that will require additional remote terminals or FTTP deployment to provide broadband service after VPA makes all of the rural central offices DSL capable. At the current deployment rate ((**Begin Proprietary) (End Proprietary)** additional broadband capable lines per year), VPA will require 14 to 16 additional years to comply with the NMP commitments. Using the current deployment plans, VPA would be unable to meet its 2015 commitment to provide broadband service to 100 percent of the customers in the VPA service area. To meet this commitment, VPA will need to increase the rate of deployment of rural remote terminals, increase deployment of FTTP in the rural areas, or identify some other technology it will use to satisfy this requirement.

Verizon provided to Liberty network engineering guidelines[352] that explain the types of analysis and the conditions VPA planning and engineering personnel should consider prior to adopting a FTTP deployment plan. Some of the requirements include known growth, route diversity, existing and planned remote terminal sites, and regulatory initiatives such as Chapter 30 in Pennsylvania.[353] Verizon explained that it prepares a business case to support the deployment of FTTP on a case-by-case basis and that there are no documents outlining guidelines for the deployment of FTTP in individual wire center serving areas.[354]

The table below outlines the status of VPA's FTTP deployment as of end of 2006.[355] VPA noted that by late in 2007 it had begun FTTP construction in seven additional urban wire centers, that FTTP service was available in all but seven of the wire centers, and that some ongoing provisioning continues in the rest.[356]

Table 5-2

Wire Centers with FTTP

Exchange Classification	Total Wire Centers	Wire Centers with FTTP in Various Stages of Construction	Percentage of Offices with FTTP
Rural	221	**(Begin Proprietary)**	
Suburban	126		

[351] NMP pp. 8, 13, and 23.
[352] Response to Data Request #89.
[353] Response to Data Request #253 and Document #1998-00397-OSP, pp. 13 and 14.
[354] Response to Data Request #246.
[355] VPA Sixth Biennial Update, p. 22.
[356] Responses to Data Requests #248 (revised) and #339.

Urban	39		
Total	386		**(End Proprietary)**

Verizon indicated that FTTP is most economically feasible as an option in densely populated residential areas (urban and suburban) and has limited applications in less densely populated rural areas.[357] Verizon's fiber network engineering guidelines describe two primary conditions for placing fiber in the loop plant. The first is a greenfield application, typically a new development. Such deployment would directly contribute to meeting VPA's broadband commitment. The second type of deployment is to overlay the existing network. In these cases, the impact of the FTTP deployment on VPA's broadband NMP commitment is less because many of the urban and suburban access lines already have broadband availability through DSL. The table above shows that Verizon's plans are consistent with this approach. The majority of its investment appears to be where population density supports its deployment. Based on VPA's current FTTP deployment strategy this indicates that the majority of the less densely populated areas of the state are likely to require substantial remote terminal investment or an alternate technology to achieve the 2015 commitment.

Capital Budgeting Process

The capital budget demonstrates VPA's process for complying with the commitments of the NMP. VPA's engineering and construction organizations use the capital budget to fund, manage, construct, and track the development of new telecommunication plant throughout Pennsylvania. It identifies the capital and labor resources required, recognizing the competing nature of the requirements, assigning priorities to network engineering and construction projects, and allocating the capital funds to be used. Verizon tracks each project's capital cost by accounting codes on a monthly basis with projected and actual costs compared for variances. VPA reviews variances between the committed and projected capital budget monthly, with the variances either reconciled or explained.

Verizon prepares and issues capital budget guidelines at the corporate level and VPA, like other Verizon subsidiaries, is required to follow the corporate guidelines. The capital budget guidelines apply to Verizon Domestic Telecom Business units including Network, National Operations, National Sales, Corporate Services (Telecom Facilities), Telecom Finance, and Telecom Human Resources. Verizon periodically updates the guidelines, with the last change occurring in 2004. VPA used these guidelines to prepare the capital budgets for Pennsylvania for the Sixth Biennial Update years of 2005 and 2006.

Telecom Capital Management (TCM) is responsible for development, management, analysis, reporting, and control of the Capital Budget for Domestic Telecom. It is the focal point and advocate for each business unit relative to capital budget management and processes, including on-going change management. TCM prepares current and commitment view budget reports. It

[357] Interview #9, October 26, 2007.

provides these by project and state to keep senior management informed of targets and status on a year to date basis.

VPA prepares an annual capital budget based on the corporate guidelines. The capital cycle commences in May or late in the second quarter and is completed in December of the same year. The budget cycle is initiated with a baseline budget amount provided by the Verizon finance organization.[358] The engineer/planner submits a list of projects VPA is requesting to build. Before this, all planning activity for the budget year has been completed along with the required financial analysis. Priorities have been established through negotiation between various interest groups at VPA and corporate. The capital budget submitted contains projects with estimated costs including manpower requirements along with the costs of completion of the project. At the completion of the cycle, capital funds have been committed to fund the construction projects that have been identified as high priority in the implementation of the NMP.[359]

VPA's Business Unit Capital Budget Coordinator (Coordinator) serves as the internal focal point for capital budget issues and processes for that business unit. The Coordinator has the responsibility to ensure that the business unit adheres to the Capital Budget Guidelines, enforces management budget change rules, ensures deployment plans are in alignment with business cases and current commitment budget view, and coordinates changes and transfers in the capital budget. Finally, during development of the commitment view, the Coordinator works with the business unit on prioritization of requirements and with the Business Unit Finance Vice President to support capital commitments. For example, the Coordinator works a business unit to determine project priorities and to change the commitment budget by reassigning capital from one project to another. In such cases, the Coordinator ensures that such determinations and changes are in compliance with the management budget change rules.

The Business Unit Portfolio Focal Point/Checkbook Owner/Class of Plant Manager (BUPFP) is responsible for coordinating and creating business cases, that is, cost/benefit studies performed to justify the investment. This includes ensuring that proposed purchases meet class-of-plant criteria and standards plus gathering all required concurrences prior to submitting a business case to the Coordinator. During the development of the commitment view, the BUPFP is responsible for coordinating Business Unit submissions. After business case approval, the BUPFP's responsibility shifts to managing funds. The BUPFP assists engineers in developing specific cost (work orders) estimates for use in requesting fund releases. The BUPFP usually requests fund releases from TCM but can directly authorize release of funds in some cases. The BUPFP is responsible for maintaining the business unit capital budget by ensuring that funds released do not exceed authorized project balance. BUPFP notifies the Coordinator of any change in project status in accordance with Change Management rules. This would include originating any transfer request or change request.

Field Personnel/Engineers (engineers) within a business unit in the capital budgeting process are responsible for developing required business cases. The engineers work with the BUPFP to ensure that proposed purchases meet class-of-service plant requirements. After business case

[358] Interview #9, October 23, 2007.
[359] Interview #9, October 23, 2007.

approval, the engineers work with the BUPFP to develop specific cost estimates for use in requesting funds. Engineers are responsible for using proper tracking codes when detailing projects with their databases. Finally, they are responsible for ensuring that capital releases do not exceed project budgets and project releases do not exceed project release/budget.

When the capital budget development begins in May of the current year, TCM notifies business units to begin to develop business cases in the Business Case System (BuC$). The projects associated with the business cases are prioritized by business units and then by TCM along with Finance vice presidents and the Executive Capital Management Committee. A number of iterations of reviews occur before finalization of the capital budget. During these reviews, priorities are established for the business cases that are included in the Commitment Capital Budget. In this process, Verizon allocates the overall budget to the different state entities, such as VPA, and those entities determine which projects will be funded. VPA indicated that multiple organizations are involved with establishing project priorities. VPA identified a number of considerations in establishing priorities, but because NMP is a regulatory mandated program, it has the highest priority for funding.[360]

By October of the current planning year, the final capital budget target is provided to each of the business units. The business units are then responsible for preparing a prioritized list of projects that can be supported within the capital, revenue, and expense targets. The VFRAME, described in the Task Area 4 chapter of this report, is the official source for managing and tracking the approved capital budget for all business units within Verizon's Domestic Telecom organization. All commitment budget changes, including transfers and changes, will be tracked against the original budget. The Current View budget will reflect all changes and transfers as approved and reported by Telecom Capital.

Liberty believes that VPA's planning process is adequate for the development of the current year commitment budget. However, this budget provides only a very short-term view of VPA's planning and capital budgeting for meeting its future NMP commitments. Projected capital budgets for two years would provide additional direction and assurance to the Commission that VPA's long-term NMP commitments are being properly planned and funded. This is discussed in more detail in Finding 5-1.

Capital Budget

Liberty reviewed and analyzed the capital expenditures shown in the VPA Sixth Biennial Update. In this report, VPA includes information on projected levels of capital investment for 2007 in the "Chapter 30," "DSL," "FTTP," and "IntelliLight" budget categories.[361] Liberty requested and received supporting documentation for these projected investment figures.[362] As discussed in Finding 5-2, the supporting documentation indicates that VPA misreported three of the four investment figures.

[360] Interview #9, October 26, 2007 and response to Data Request #9.
[361] VPA Sixth Biennial Update, p. 25.
[362] Response to Data Request #327.

VPA included a chart in the Sixth Biennial Update showing cumulative gross capital expenditures during the period between the start of the NMP in 1994 and 2006. These numbers represent all VPA capital expenditures, not the expenditures specific to the NMP. They also are cumulative rather than yearly numbers. VPA subsequently amended the 2005 and 2006 numbers. In the table below, Liberty shows these numbers, with the derived yearly expenditures and year-over-year percentage change in the expenditures.

Table 5-3

Gross Capital Expenditures

Year	Cumulative Gross Capital Expenditures (Millions)	Yearly Gross Capital Expenditures (Millions)	Year/Year Expenditure Change
1994	**(Begin Proprietary)**		
1995			
1996			13.6%
1997			21.0%
1998			24.9%
1999			9.0%
2000			21.2%
2001			-19.8%
2002			-26.2%
2003			-31.8%
2004			-3.9%
2005 (amended)			38.9%
2006 (amended)		**(End Proprietary)**	13.2%

These data demonstrate that for the period starting at the end of 2000, annual total capital spending in Pennsylvania declined from a peak of approximately **(Begin Proprietary)** **(End Proprietary)** down to approximately **(Begin Proprietary)** **(End Proprietary)** in 2004. This decline was reversed in 2005, when VPA's annual capital spending, including NMP expenditures, increased to **(Begin Proprietary)** **(End Proprietary)**. Capital spending also increased in 2006 to **(Begin Proprietary)** **(End Proprietary)**.

The figures in the table above represent total gross capital expenditures. The chart below shows net capital expenditures for 2004, 2005, and 2006, together with the budgeted expenditures for

2005 and 2007.[363] Liberty notes that the actual net expenditures in 2005 exceeded the amount budgeted for that year in 2004.

Table 5-4

Net Capital Expenditures by Budget Category

(Begin Proprietary)

(End Proprietary)

Some of the "Chapter 30" expenditures are related to FTTP. Therefore, it is not possible to determine the total FTTP expenditures based on the numbers Verizon provided. However, Liberty notes that even the expenditures restricted to the "FTTP" budget category represent a very large portion of the total gross capital expenditures (approximately 50 percent in 2005 and 2006) and an even larger portion of the NMP-specific net capital expenditures (greater than 80 percent in 2005 and 2006). This allocation of the majority of the NMP-specific expenditures began in 2005, and the 2005 budget data indicates that Verizon had included this shift in its planning for 2005. Liberty also notes that the difference between 2005 budgeted and actual FTTP expenditures show that those expenditures were significantly larger than originally planned.

Given VPA's long-term NMP commitments, it seems unlikely that FTTP can continue to be such a large portion of the budget. Verizon has a long-term commitment to deploying broadband in Pennsylvania. Verizon has deployed DSL and FTTP in the more densely populated areas of the state. The areas where broadband is not available are in the less densely populated rural areas of the state, which will require substantial investment on the part of Verizon in order to meet its 2015 NMP commitments and will likely require capital expenditures which are very different in allocation among the different broadband technologies than Verizon is currently making. In particular, a larger share of the budget will likely be required in DSL rather than FTTP technology. The lack of information in the biennial updates projecting capital investments beyond the next year limits the ability of the Commission to assess the future direction of the NMP commitments.

[363] Fifth and Sixth VPA Biennial Updates, and Data Requests #45, #185, and #187.

C. Findings and Recommendations

Liberty found that Verizon's network planning and funding process and capital budgeting process were adequate as they relate to meeting the VPA commitments for the period of the Sixth Biennial Update (2005-2006) and that the data quoted in the biennial update are consistent with the internal documents Liberty was able to review. However, the majority of Verizon's current and projected capital investments are in FTTP (FiOS) and these investments have been and are likely in the future to be made in the densest population areas of Pennsylvania, where Verizon already provides DSL Broadband service. Therefore, Verizon may need to explore alternative approaches to providing broadband service than it is currently using and/or to commit a larger share of its capital investments to other technologies in order to meet 100 percent broadband availability by 2015.

Finding 5-1: The VPA Sixth Biennial Update reported a projected capital commitment budget that fails to provide the Commission an adequate view of the capital requirements and construction plans required to remain on schedule to meet the 2015 NMP broadband commitments.

Item 8 of the Commission's Chapter 30 Biennial Update Reporting Guidelines for Local Exchange Carriers states that "the biennial updates should provide the level of investment being made to develop the broadband network. Specifically, information regarding the historical, current, and *projected* levels of capital investment in the network … should be provided. [emphasis added]"[364] In the VPA Sixth Biennial Update, filed on July 2, 2007, Verizon provides its gross capital expenditures for each of the two years covered by that report, 2005 and 2006. Verizon provided a projected capital budget for only one year after the period covered by VPA Sixth Biennial Update. That is, Verizon provided the projected Pennsylvania capital commitment budget only for 2007. Providing only the 2007 budget provides limited insight on how Verizon intends to meet its ultimate broadband commitment. It also provides insufficient information on how Verizon plans to meet even its 2008 commitment.

Verizon indicated that it has estimated the number of access lines that must be made broadband capable for each future two-year period through 2015 to meet its NMP objective.[365] These numbers, could directly translate into additional capital requirements. In the Sixth Biennial Update, Verizon projected an expanded 2007 capital budget both for DSL and FTTP, but by far the largest component of this increase was for FTTP. Due to the high cost of FTTP deployment in less dense areas, it is unlikely that an expanded FTTP program will close the gap between the current broadband availability in suburban and rural areas and Verizon's 2015 commitment of 100 percent availability in those areas. Furthermore, it will also be increasingly expensive for Verizon to use DSL as a means to reach 100 percent availability in those areas, because that

[364] Act 183 modified filing and reporting requirements for local exchange carriers at section 3015(f), 66 Pa. C.S. 3015(f), and the Commission addressed these new requirements in its Final Rulemaking Order at L-00050176 entered August 21, 2006. However, the Final Rulemaking Order at L-00050176 did not address or otherwise amend the 13 Guidelines or more specifically the NMP reporting requirements pursuant to section 3014, 66 Pa. C.S. 3014.
[365] Response to Data Request #249.

approach will require deployment of additional remote terminals and upgrading existing remote terminals to make them capable of supporting DSL service.

Liberty recognizes that, at present, Verizon prepares a one-year capital commitment budget. The capital commitment budget identifies the amount of capital that has been allocated to Pennsylvania and specifies the construction plans and costs for that year. Based on Liberty's industry experience, Verizon's capital commitment budget is consistent with practices at other telephone companies. However, it has also been Liberty's experience that telephone companies prepare out-year planning budgets for planning purposes. To the extent that Verizon has an out-year NMP planning budget or at least a preliminary budget for the second year in the two-year reporting cycle, this information would provide the Commission insight on how Verizon is proceeding with its NMP plans.

In reply,[366] Verizon gave three reasons why it believes it should not be required to provide such additional planning and budgeting data:

1. The Commission's biennial update reporting guidelines (Guideline #8) require Verizon to provide "projected levels of capital investment" but do not define specific time frames for those projects.
2. Verizon cannot provide capital investment levels for two calendar years because its process requires VPA to use an 18-month planning and budgeting timeframe such that all capital projects required to maintain compliance with the VPA NMP can only be allocated funds in the latter half of the year prior to their construction.
3. Given, the ever-advancing technology becoming available to meet the NMP commitments, it is neither practical nor helpful to rely on long-term financial projections. Verizon uses the Golden Source database to periodically determine the current status of meeting its next NMP broadband benchmarks. It has determined, for example, that nearly 50,000 rural loop qualifications must be provisioned each calendar year to satisfy its next benchmark, 100 percent broadband availability by 2015. Verizon states that it has budgeted sufficient capital to meet this goal over the next year.

Recommendation 5-1: Provide sufficient information in the biennial updates to support its ability to meet its 2015 NMP commitments, in addition to providing its projected commitment budget for the first year after the reporting period.

Without additional planning and budgeting data in the biennial update, the Commission has inadequate information to determine whether Verizon is on track to meet its NMP commitments. Liberty recognizes that any plans represent best guesses based on current knowledge and technological options available. However, this does not mean that they do not provide useful information to the Commission. Although Verizon's internal planning process may not allow the provision of precise numbers beyond one year after the biennial update reporting period, VPA

[366] Response to Preliminary Finding #32.

still should be able to provide information sufficient to assure the Commission that it is on track to meet its NMP commitments.

Finding 5-2: Verizon misreported the projected levels of 2007 capital investment for the DSL, FTTP, and SONET ring IntelliLight budget categories in the VPA Sixth Biennial Update.

In the VPA Sixth Biennial Update, Verizon indicated that it projected capital investment in 2007 of "nearly **(Begin Proprietary) (End Proprietary)**" for "DSL," "over **(Begin Proprietary) (End Proprietary)**" for "FTTP," and **(Begin Proprietary) (End Proprietary)** for "SONET ring IntelliLight facilities."[367] However, Verizon's supporting documentation for these three budget categories indicate that the actual 2007 budgeted capital investment amounts are **(Begin Proprietary) (End Proprietary)** for the DSL budget category, **(Begin Proprietary) (End Proprietary)** for FTTP budget category, and **(Begin Proprietary) (End Proprietary)** for the IntelliLight budget category.[368]

Verizon indicated that the errors were "inadvertent" and corrected them in a subsequent amendment to the VPA Sixth Biennial Update.[369]

Recommendation 5-2: Review internal controls, validation, and staffing to ensure accurate reporting of the capital budget data in VPA's biennial updates.

Misreporting of projected capital investment in Pennsylvania hampers the Commission's ability to track Verizon's progress toward meeting its NMP commitments. In this case, Verizon overstated the projected DSL investments by $107 million. This overstatement is significant, because VPA may need to make significant additional investments in DSL between 2007 and 2015 in order to meet its ultimate broadband commitments in Pennsylvania. To avoid this situation in the future, Verizon should assure the appropriate staffing to produce the biennial updates and thoroughly review the information to be reported before issuing the report.

[367] VPA Sixth Biennial Update, p. 25. Liberty noted in Finding 4-2 that Verizon uses the terms "DSL," "FTTP," and "IntelliLight" to refer to budget categories for certain corporate initiatives and that the numbers do not necessarily represent the full investments in DSL, FTTP, and SONET ring facilities in Pennsylvania, because some of those investments appear in the "Chapter 30" budget category, which is reserved for local Pennsylvania broadband initiatives.
[368] Response to Data Request #327.
[369] April 22, 2008 filing to amend the Sixth Biennial Update.

Appendix A: Physical Testing Sampling Approach

A. Background

Task Area 3 of the NMP Audit required physical verification of a sample of VPA's facilities. In order to observe a representative group of the more than four million VPA lines and 386 central offices, Liberty used statistical sampling that involved three separate samples and testing approaches.

The first sample ("CO Sample") involved a comparison of Verizon's inventory records with the equipment actually installed in Verizon's central offices and in the outside plant served by the central offices. The sample included 23 central offices, 20 of which Liberty selected using a random sample stratified by LATA and exchange classification. After review of the sample by Staff, Liberty added three other central offices chosen to assure adequate representation of areas of interest within the VPA serving area. The central offices visited by Liberty during its physical audit are identified in Table A-1.

Table A-1

Sample of Central Offices in Liberty's Physical Audit

Central Office Location	Common Language Code	Exchange Classification	LATA	Selected by Random Sample
McVeytown	MVTWPAES	Rural	226	Yes
Dauphin	DAPHPADA	Rural	226	Yes
Millersville	MIVLPAMI	Rural	226	Yes
Lancaster	LNCSPALA	Suburban	226	Yes
Oxford	OXFRPAOX	Rural	228	Yes
Media	MEDIPAME	Suburban	228	Yes
Bethayres	BTHYPABH	Suburban	228	Yes
Evergreen	PHLAPAEV	Urban	228	Yes
Eastwick	PHLAPAEW	Urban	228	No
Kane	KANEPAKA	Rural	230	Yes
Reynoldsville	RYVLPARE	Rural	230	Yes
Bradford	BRFRPABR	Rural	230	Yes
Warren	WRRNPAWA	Suburban	230	Yes
Minersville	MNVIPAMI	Rural	232	Yes
Mount Carmel	MTCRPAMC	Rural	232	Yes
Wallenpaupack	WLPKPAES	Rural	232	Yes
Wyoming	WYNGPAWY	Suburban	232	Yes

Williamsport	WLPTPAWI	Suburban	232	No
Monongahela	MNGHPAMO	Rural	234	Yes
Coraopolis	CRPLPACO	Suburban	234	Yes
Robinson Township	RBTPPART	Suburban	234	Yes
Carrick	PITBPACA	Urban	234	Yes
East Liberty	PITBPAEL	Urban	234	No

Liberty's physical audit also involved observation of circuit testing to test VPA's assumptions regarding DSL/broadband availability. Liberty originally intended to observe the circuit testing in the sampled central offices identified in the CO Sample using only circuits served by those offices. However, Verizon indicated that it performs all of its DSLAM, MLT and Celerity testing from centralized test centers and that the field technicians do not have the expertise to perform these tests.[370] As a result Liberty drew the two samples of circuits from the entire VPA service area: a "DSL Sample" and a "General Sample." Based on its industry experience Liberty was confident that the results in a centralized test and a central-office-based test would be the same because Verizon uses the same test equipment to perform the tests. Nonetheless, Liberty conducted a retest of a sample of lines in the bulk test sample on the day after it conducted the bulk testing to ensure the quality of the bulk test.

The DSL Sample was a sample of working DSL lines. Liberty used this sample to test the current as well as the maximum attainable data speeds on existing DSL lines in both the upstream and downstream directions. To accomplish this, Liberty used the testing capability of the DSLAM equipment that provides DSL service on these lines. Liberty limited this testing to working DSL lines because of the DSLAM equipment needed to perform this testing. As described in the Task Area 3 chapter of this report, Liberty also performed a MLT and, where possible, a Celerity test on these same lines.[371] The MLT and Celerity tests provided Liberty with information on the total length of the loop facilities on the circuits being tested.

The General Sample was a sample of all working POTS and DSL lines in VPA's service area. Liberty used this sample to perform a MLT and, where possible, a Celerity test. The MLT test provided Liberty with information on the total length of the loop facilities for the circuits tested and the Celerity test provided information on the resistive loss on the lines as well as the total loop length. Liberty used the results of these tests to measure the accuracy of Verizon's "Golden Source" database used by Verizon to report on its progress toward meeting its NMP DSL/broadband availability commitments.

[370] Response to Data Request #278.
[371] Verizon has Celerity testing capabilities in 103 of its 397 central office switches.

B. Sample Approach

In this section, we discuss several key components of the sample:[372]

- Objective of the sample
- Target and Sampled Populations
- Sampling Frame
- Sampling Unit
- Method of selection of sample
- Sampling technique
- Organization of the field work
- Measurements to be made
- Estimation method
- Required precision and sample size.

The *objective of the sample* was two-fold: i) to determine the accuracy of VPA's assumptions concerning availability of DSL and broadband service at data speeds greater than 1.5 Mbps based on the length of the customer's loop and ii) to determine the accuracy of the results reported in the Sixth Biennial Update. As noted in the Task Areas 1 and 2 chapter of this audit report, VPA bases its reported broadband availability on the fact that it considers any line with loop length of less than 12 kft from a DSL-capable central office to be broadband capable (that is, capable of supporting data speeds of at least 1.5 Mbps). Similarly, Verizon considers any line with loop length of 18 kft or less available for DSL service if its central office is DSL capable. VPA considers all lines greater than 18 kft to be not qualified. For offices that have Celerity testing capability, VPA used line loss rather than loop length as the determining factor. In these offices VPA considers any line that contains a line loss of less than or equal to 57dB to be available for broadband service at data speeds of at least 1.5 megabits per second. VPA considers any line with a loss greater than 57dB and up to 70dB to be available for DSL service at any data speed. Any line with a line loss greater than 70dB VPA considers not qualified.[373] By checking both the validity of these assumptions and the accuracy of VPA's loop length and line loss figures, Liberty was able to make a determination of whether VPA's reported figures are accurate and to give an estimate of that inaccuracy.

The *target population* is the population that Liberty wished to make inferences about. In this case, the target population consisted of all lines in the VPA territory used in the quoted results for the Sixth Biennial Update.[374] The *sampled population* is the group of items that Liberty actually sampled from. Whenever possible, the target and sampled population should be the same. In this case, the sampled population is slightly different because of timing. The target population consists of the inventory of all residence and business working lines as of the end of

[372] Most of these components are discussed in general in Cochran, William G., *Sampling Techniques, 3rd Edition,* John Wiley & Sons, 1977, New York, pp. 4-7.
[373] Response to Data Request #220 (revised).
[374] This excludes the Verizon lines in Pennsylvania, located in the former GTE territory (Verizon North).

2006, as provided by VPA to Liberty.[375] The sampled population consisted of all such working lines, as inventoried by Verizon at the time Liberty chose the sample for performing the circuit testing in February 2008.[376] These two populations differ somewhat because of changes that took place in the lines in-service between the end of 2006 and February 2008.

The *sampling frame* is the database or listing used to draw the sample. Liberty uses the list of WTNs, with line-level detail of loop length and availability provided by VPA,[377] as well as a list of DSL lines VPA provided to Liberty.[378] Liberty merged the two datasets to create the sampling frame.

The individual *sampling unit* is the individual item on which measurements are taken. For these samples, Liberty used a single WTN as the unit.

The *sampling technique* is the statistical technique used to draw the sample. Liberty performed a stratified random sample for the DSL Sample, and the strata were determined by the loop length information provided by Verizon.[379] The stratification enabled Liberty to determine a precise measurement of the accuracy of VPA's availability data for different loop lengths. Small inaccuracies near the critical loop lengths of 12 and 18 kft can mean that Verizon is incorrectly representing availability, while even large inaccuracies in loop length for loops much less than 12 kft or much more than 18 kft do not necessarily mean that Verizon is incorrectly characterizing availability. Thus, the stratification allowed Liberty to better determine the *practical* significance of loop length inaccuracies. For the General Sample, the sampling technique is a simple random sample. In this sample, Liberty is focusing on overall precision and thus stratification is not required.

Verizon performed the circuit testing under Liberty's guidance and supervision using a bulk testing method. This testing method involved the personnel in Verizon's centralized test center programming the Verizon testing tools to perform the tests prescribed by Liberty on the lines identified by Liberty in the General and DSL Samples. Verizon returned the test results to Liberty via Excel spreadsheet attachments to emails. On the following day a team of Liberty professionals performed manual re-tests of approximately 400 lines, randomly sampled from the General and DSL Samples.[380] As explained above, the objective of the retest was to ensure that the bulk test results did not differ from the results as measured in a manual test.

For the DSL Sample, Verizon made *measurements* concerning the current attainable data speed and the maximum attainable data speed in both directions as well as the loop length on the line.

[375] Response to Data Request #56.
[376] See response to Data Request #295 for exact dates and dataset used.
[377] Response to Data Request #295.
[378] Response to Data Request #241.
[379] Response to Data Request #56.
[380] Liberty selected 225 lines at random from each sample in order to do the re-testing. Since testing was impossible on a small percentage of lines, the yield of the test and re-test was approximately 90 percent, resulting in a re-test yield of about 200 lines each for the General and DSL Samples.

For the General Sample, VPA tested for the loop length and, where possible, the resistive loss on the line.

The *method of estimation* is the statistical estimate used to quantify the results. Liberty used a stratified mean estimate, in the case of the DSL sample, and a mean estimate, in the case of the general sample. Liberty generated a 95 percent confidence interval for the estimates, based on the sample results. The Mathematical Formulations section of this appendix provides details of these estimates.

The total *sample size* for the DSL sample was approximately 3000 lines. The following table shows the DSL sample size by strata.

Table A-2

DSL Sample Summary

Loop Length (in kft)	Rural	Suburban	Urban	Total
Less than 8	36	59	30	125
08 to 9	26	51	61	138
09 to 10	24	56	58	138
10 to 11	21	71	46	138
11 to 12	51	112	83	246
12 to 13	69	173	129	371
13 to 14	72	196	103	371
14 to 15	71	205	108	384
15 to 16	87	194	103	384
16 to 17	93	219	72	384
17 and up	79	235	70	384
Total	629	1571	863	3,063

Liberty chose the above sample sizes with a target *precision* of plus or minus 5 percent at the 95 percent confidence interval. Because Liberty assumed a much greater error rate than requested in the RFP process,[381] sample sizes were higher than those suggested by the RFP precision guidelines (which were based on the same precision of 5 percent but an error rate of 1 percent). Liberty did not stratify the sample by the density designation of rural, suburban, and urban, but Liberty shows those designations in the table to demonstrate the coverage of these three density classifications.

[381] Item 8 of the RFP states: "[v]erification, on a statistically valid test basis, the accuracy and reliability of the data in the VPA's outside plant engineering databases and any other systems VPA uses to determine an access line's broadband qualification." In answer to questions raised by potential suppliers, the Commission Staff clarified that the statistical requirements for the test sample should be such that it be able to identify, with a 95 percent confidence interval, an observed value that has no more than a 5 percent error rate. In addition, the field data was expected to be tested using the hypothesis that the data has a 1 percent maximum error rate. Because the response to Data Request #121 indicated a much higher error rate, Liberty used this higher rate in determining sample size.

Liberty assumed a higher error rate of broadband speed classification due to information Verizon provided on system-wide tests of circuit samples,[382] which showed error rates of up to 77 percent in stated broadband speed relative to VPA's assumption that loops over 12 kft could not support broadband. The following table shows the loop length tested by Verizon in its system-wide test,[383] the corresponding stratum in the Liberty sample, Verizon test results (including error rate), Liberty's assumed error rate,[384] and the sample size needed for 5 percent precision. Note that for loop length ranges less than 12 kft, Verizon did not provide a breakdown of loop lengths tested. Therefore, Liberty made assumptions about the error rate in those ranges.[385]

Table A-3

Broadband Qualification Sample Size Requirements

Verizon Test Range (kft)	Liberty Loop Length Strata (kft)	Number Broadband Qualified	Total Lines Tested	Percent Broadband Qualified	Error Rate in Verizon testing	Liberty Assumed Error Rate for Physical Sample	Sample size needed for 5 percent precision
	up to 8					5%	73
	8-9					10%	138
	9-10					10%	138
	10-11					10%	138
	11-12					20%	246
0-12	NA	623	663	94%	6%		
12-13	12-13	33	43	77%	77%	59%	371
13-14	13-14	41	56	73%	73%	59%	371
14-15	14-15	45	76	59%	59%	59%	371
15-16	15-16	47	69	68%	68%	48%	384
16-17	16-17	36	57	63%	63%	48%	384
17-18	17-18	39	81	48%	48%	48%	384

In the right-most column, the table shows, for each loop length stratum, the required sample size to achieve 5 percent precision at the 95 percent confidence interval. Liberty derived this sample

[382] Response to Data Request #121.

[383] This testing involved Verizon's entire footprint from Maine to Virginia and was not limited to lines in the VPA territory.

[384] Liberty's assumed error rate was conservatively calculated as the minimum error rate of the loops within 3 kft above the loop length category in question. Thus, for example, for loop lengths between 12 and 13 kft, the error rate is 77 percent. For loop lengths between 13 and 14 kft, the error rate is 73 percent, and for 14-15 kft, the error rate is 59 percent. Liberty used the error rate of 59 percent for the 12-13 kft category, because this yields the highest sample variation (the closer a rate is to 50 percent, the higher the sample variation).

[385] Since the error rate in the range of 0-12 kft for Verizon's testing was 6 percent, and the number of lines in the next category (12 to 13 kft) that provided broadband was 23 percent (100 percent-77 percent), Liberty assumed the error rate would be less than 23 percent. Also, Liberty subject matter experts believe that the vast majority of lines below 8 kft are capable of broadband, and thus Liberty assumed (conservatively) that at most 5 percent of those lines would not be capable.

size using a Normal approximation to the Binomial distribution. Except for the initial stratum, the actual sample size is approximately the sample size shown in the right-most column. For the initial stratum, of up to 8 kft, Liberty pulled a minimum sample size of 125, instead of the required sample size of 73, to ensure sufficient sample size, given the large range of loop length in the stratum.

C. Mathematical Formulations

This appendix contains the formulas used in calculating the estimates described above. Liberty is estimating i) broadband availability and Verizon's database accuracy in reporting this availability; ii) DSL availability and accuracy; and iii) loop length and database accuracy in reporting loop length.[386] For convenience, Liberty defines variables below using broadband accuracy definitions. The DSL and loop length accuracy and precision calculations are analogous.

First, Liberty defined the terms necessary for the estimates:

- N = total number of lines in the population
- N_L = Number of lines in the population with loop length stratum L, where L is one of the strata defined by ranges of loop length and given in the above table of strata.
- n_L = Number of lines sampled with stratum L.
- bb_{Li} = 1 if Verizon's broadband determination, according to their databases, matches the results Liberty observed in the field, for stratum L and line *i*;
  = 0 if Verizon's broadband determination, according to their databases, *does not* match the results Liberty observed in the field, for stratum L and line *i.*
- $\overline{bb}_L$ =average of bb_{Li} across all lines sampled with stratum L.
- $s_L = \sqrt{\overline{bb}_L(1-\overline{bb}_L)/n_L}$, the estimated standard deviation of the broadband accuracy for loop length L.
- $\hat{bb}$ = estimate of accuracy for overall broadband availability in Verizon's databases.

[386] Liberty used the sample to answer the two separate issues of availability and accuracy. Accuracy can be measured for each item, and refers to whether the broadband (or DSL) availability is what Verizon's database says it is. Availability is expressed as a percentage of all lines with broadband (or DSL) available. Liberty used the sample to estimate that independent of Verizon's database determinations. Liberty could then compare the sample estimate of availability to VPA's reported figures of broadband (or DSL) availability. The database can have many inaccuracies without affecting VPA's reported figures on availability, if the inaccuracies are equal in terms of misidentifying lines that do have broadband available as not having broadband available and misidentifying lines that do not have broadband available as having broadband available.

Accuracy Estimate

The accuracy estimate $\hat{bb}$ is calculated as follows:

$$\hat{bb} = \sum_{L} \frac{(N_L(\overline{bb}_L))}{N}$$

In the above, the sums are taken over every relevant loop length combination, and multiplied by the number of lines, creating an estimate weighted by the number of lines.

The variance of this estimate is:

$$V\left(\hat{bb}\right) = \sum_{L} \frac{N_L^2}{N^2} s_L^2$$

The standard deviation of the estimate is the square root of the variance:

$$sd\left(\hat{bb}\right) = \sqrt{V(\hat{bb})}$$

The precision of the accuracy estimates at the 95 percent confidence interval is approximately plus or minus 1.96 multiplied by the standard deviation. For estimates of accuracy within a particular loop length stratum L, the same calculations can be performed, but the sums are not taken over the loop length strata, and the quantity N_L equals the quantity N.

D. Summary

Liberty used a sample of central offices, the CO sample, for observations of VPA equipment in the field. Liberty physically tested the accuracy of Verizon's reported Broadband and DSL availability using two additional samples: the DSL Sample and the General Sample. Liberty designed these two samples for Verizon to test centrally, using a bulk testing method. The DSL Sample was designed to provide precision of better than plus or minus 5 percent at the 95 percent confidence level for each stratum of loop length, with conservative assumptions about error rates. The General Sample was sufficient to provide precision of better than 5 percent at the 95 percent confidence level, for any error rate.

Appendix B: Glossary of Acronyms

ACNA	Access Customer Name Abbreviation
AFUDC	Allowance for Funds Used During Construction
ALIS	Access Line Information System
ANP	Area Network Plan
ATM	Asynchronous Transfer Mode
BuC$	Business Case System
BUPFP	Business Unit Portfolio Focal Point
CABS	Carrier Access Billing System
CAPEX	Capital Expenditures
CO	Central Office
CP	Content Providers
CPCIRS	Circuit Provisioning Center Information Reports System
CRIS	Customer Record Information System
CSA	Carrier Serving Area
CSR	Customer Service Record
DS1	Digital Signaling Level 1
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber-Line Access Multiplexer
EMS	Element Management System
EMT	Engineering Modeling Tool
EXACT	Exchange Access Control and Tracking
fBA	Former Bell Atlantic
FCC	Federal Communication Commission
FOCIR	Fiber Optic Cable Inventory Record
FTTP	Fiber-to-the-premises
ILEC	Incumbent Local Exchange Telecommunications Company

IOF	Interoffice Facilities
ISDN	Integrated Services Digital Network
ISP	Internet Service Providers
Kft	Kilofeet
LATA	Local Access Transport Areas
LEC	Local Exchange Carrier
LFACS	Loop Facilities Assignments Records System
LQP	Loop Qualification Processor
MLT	Mechanized Loop Testing
NGDLC	Next Generation Digital Loop Carrier
NMP	Network Modernization Plan
NPA	Numbering Plan Area ("area code")
NXTT	National xDSL Test Tool
NXX	Telephone Number Prefix ("exchange")
OCD	Optical Connection Device
PARTS	Packet at Remote Terminals
PIS	Plant In Service
RFP	Request for Proposal
SCP	Service Control Point
SS7	Signaling System 7
SSP	Service Switching Point
STP	Signal Transfer Point
TCM	Telecom Capital Management
TIRKS	Trunks Integrated Records Keeping System
TPIS	Telephone Plant In Service
TPUC	Telephone Plant Under Construction
TTY	TeleTypewriter
USOC	Universal Service Order Code

VFRAME	Verizon Financial Reporting and Analysis Management Environment
VPA	Verizon Pennsylvania, Inc.
WTN	Working Telephone Number