

**EXAMINATION OF THE LOCAL
TELECOMMUNICATIONS NETWORKS AND
RELATED POLICIES AND PRACTICES OF
AT&T CALIFORNIA AND FRONTIER
CALIFORNIA**

**Study conducted pursuant to the California PUC Service
Quality Rulemaking 11-12-001, Decision 13-02-023, and
Decision 15-08-041**

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April 2019



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NOTICE

Nearly all of the information contained in the various AT&T California and Frontier California (including former Verizon California) data files, responses to data requests, and other source material (“ILEC Data”) that has been provided to ETI in the course of this examination has been identified by the carriers and/or by the Commission as CONFIDENTIAL AND PROPRIETARY AND SUBJECT TO CPUC GENERAL ORDER 66, PUB. UTIL. CODE SECTION 583 AND D.16-08-024, REGARDLESS OF WHETHER OR NOT A DOCUMENT OR FILE HAS BEEN EXPRESSLY LABELED AS CONFIDENTIAL. Under the terms of our Agreement no. 17PS5007 including the incorporated Confidentiality of Data/Nondisclosure Agreement (Section 9. Exhibit E), all of the contents of this report are, by default, being treated as CONFIDENTIAL AND PROPRIETARY ILEC DATA whether or not expressly identified as such.

It is our understanding that the Communications Division anticipates that a public, redacted version of this report will be released in due course, once determinations have been made by CD Staff and counsel as to which portions of its contents may be made publicly available. However, for the present, THE ENTIRETY OF THIS DRAFT REPORT IS TO BE TREATED AS CONFIDENTIAL AND PROPRIETARY AND SUBJECT TO CPUC GENERAL ORDER 66, PUB. UTIL. CODE SECTION 583 AND D.16-08-024.

PREFACE

In December 2011, the California Public Utilities Commission (CPUC) opened Rulemaking (R.) 11-12-001 to (a) review telecommunications carrier performance in meeting the GO 133-C/D service quality standards and measures in 2010; (b) assess whether the existing GO 133-C/D service quality standards and measures meet the goals of the Commission to adequately protect California customers and the public interest; (c) determine whether the existing GO 133-C/D standards are relevant to the current regulatory environment and market; and (d) determine whether there is a need to establish a penalty mechanism for substandard service quality performance. The Commission's Communications Division was directed to oversee an examination of the network facilities of AT&T California and (then) Verizon California, the state's two principal local wireline telecommunications utilities, and to engage an independent consultant to perform this examination under a contract to be managed by Commission staff.

Economics and Technology, Inc. ("ETI") was pleased to have been selected to perform this study. We adopted a "data-driven" analysis methodology utilizing the extensive service quality data that the two carriers have been regularly submitting to the Commission as required by General Order 133-C/D, together with their responses to data requests, other CPUC and public data sources, and input from the Communications Division Staff's on-site inspections. This report provides the results of our work. ETI did not, and was not required to, undertake to audit or otherwise verify the accuracy or completeness of the data that was provided to us. Various inconsistencies and gaps in the data were identified, and we used our best efforts to resolve them. Where such efforts were not successful, we noted the problems and utilized the data as best we could.

The project was conducted under the direction of Dr. Lee L. Selwyn, President of ETI, with a team consisting of ETI staff members Colin B. Weir, Vice President, Andrew J. Kearns, Senior Economic Consultant, and Daniel W. Maggio and Elle G. Tibbits, Economic Analysts. Our work has greatly benefitted from the extensive input and assistance that we received from the Communications Division Staff, including in particular Louise E. Fischer, who served as Project Manager with respect to our work, and Karen Eckersley, which we gratefully appreciate and acknowledge. We also appreciate the cooperation that we received from both carriers in the course of this work.

Boston, Massachusetts
April 2019

1 | EXECUTIVE SUMMARY AND OVERVIEW OF THIS REPORT

Organization of this Chapter

This chapter is organized into five sections that are intended to provide a concise summary of our extensive examination of the network infrastructures of California’s two largest Incumbent Local Exchange Carriers (“ILECs”) – AT&T California and Frontier California:

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Key Conclusions and Recommendations resulting from this study

Conclusions

Following is a brief summary of the principal conclusions resulting from Economics and Technology, Inc.’s (“ETI’s”) examination of the network infrastructures and quality of service of California’s two principal Incumbent Local Exchange Carriers (“ILECs”), AT&T California and Frontier California.

- *Deteriorating service quality.* The quality of AT&T and Frontier voice services has steadily declined over the 8-year period from 2010-2017 that is covered by this examination, with the number of outages increasing and the service restoration times getting longer.
- *Persistent disinvestment.* Over the 2010-2017 period covered by this study, both AT&T California and Frontier California (both before and after its 2016 acquisition from Verizon)

made capital additions to their respective local exchange service networks that were less than their cumulative depreciation accruals, resulting in a decrease in the net book value of each ILEC's asset base, in effect, *disinvesting* in infrastructure overall, and most pronounced in the more rural and low-income service areas.

- *Decline in the number of POTS customers.* AT&T no longer actively markets legacy Plain Old Telephone Service ("POTS") and is instead actively promoting broadband service to customers in order to maintain and grow its revenue stream. As a result, AT&T has allowed POTS service quality to degrade over time. This strategy may explain why AT&T has failed to improve POTS service quality or achieve the minimum GO 133-C/D standards. For AT&T, the potential revenue from migrating customers to its broadband services is far greater than any financial penalty imposed by the Commission for violating the minimum service quality standards.
- *Focus upon broadband, not POTS.* Investments that were made have been primarily directed toward supporting new broadband services such as high-speed Internet access, Voice over Internet Protocol ("VoIP"), and Internet Protocol Television ("IPTV"). These broadband-focused upgrades have, however, conferred some benefit in improving POTS service quality. In locations where such investments have been made, POTS service quality has improved. Broadband-enabled wire centers achieve a better service quality performance under most General Order 133-C and D (GO 133-C/D) metrics. These upgraded wire centers have experienced fewer out-of-service incidents on a per line basis, their average outage duration was shorter, and the percentage of outages cleared within 24 hours was higher than for wire centers not upgraded.
- *Failure to adapt network infrastructure to withstand varying weather and environmental conditions.* This study provides evidence of a strong relationship between significant adverse weather conditions and an increase in the number of service outages. This pattern suggests that the networks of AT&T and Frontier are not as robust as they need to be. The occurrence of extreme weather events in California certainly can be anticipated to a certain degree and incorporated into the companies' engineering, design and construction, and maintenance practices. These networks must be able to withstand all types of inclement weather and provide safe and reliable service to customers.
- *Investment focus on higher income communities.* There is an inverse relationship between household income and wire center service quality performance. AT&T wire centers that have been upgraded with fiber optic facilities and other broadband-related investments disproportionately serve higher income communities. Consequently, the AT&T wire centers serving areas with the lowest household incomes tend to exhibit the highest trouble report rates, the longest out-of-service durations, and the lowest percentages of outages cleared within 24 hours.

- *Increased focus on areas most heavily impacted by competition.* Both carriers have experienced a persistent and massive erosion in demand for POTS lines over the 2010-2017 study period. The greatest drop-offs – in some locations of as much as 80% or more – have occurred primarily in the more densely populated urban and suburban areas where customers have a wider choice of available providers and services. Notably, it is the areas with the lowest POTS drop-off rates that have experienced the steepest deteriorations in service quality. AT&T and Frontier appear to have focused most of their attention in those communities where competition and the potential for loss of customers is greatest.
- *Financial Capability.* AT&T has the financial resources to maintain and upgrade its wireline network in California, but has yet to do so. Frontier has a strong interest in pursuing such upgrades, but lacks the financial capacity to make the necessary investments. Both of these conditions – and the commitments of the respective corporate parent companies to maintain and upgrade their California ILEC operations – must remain a central focus of CPUC attention.

Recommendations

Based upon our analysis of AT&T and Frontier service quality reports, annual financial reports submitted to the Commission, and the two companies' respective data request responses, ETI offers the following recommendations for the Commission to consider when addressing service quality going forward:

- **Recommendation 1:** Expand the financial penalties for carriers that fail to meet the minimum GO 133-C/D service quality standards.
- **Recommendation 2:** In an effectively competitive market, persistently poor service quality would drive customers to take their business elsewhere. Where competition is not present, fines imposed due to an ILEC's failure to meet service quality standards should be high enough so as to have the same financial consequences as poor service quality under competitive market conditions.
- **Recommendation 3:** The GO 133-C/D maximum Customer Trouble Report Rates of 6%, 8% or 10% (depending upon wire center size) of switched access lines per month are far too generous, and failure rates as high as these can hardly constitute acceptable service quality. The carriers have had little difficulty in meeting these standards, and they should be revised downward.
- **Recommendation 4:** Unless carriers can offer technically valid explanations as to how and why smaller wire centers experience the poorest service quality, the minimum GO 133-C/D standards should be applied uniformly for all wire centers.

- **Recommendation 5:** The GO 133-D fines should vary based upon the extent of a carrier's failure to meet any service quality standard, rising in magnitude as the extent of the shortfall increases.
- **Recommendation 6:** The Commission should retain its requirement that URF carriers maintain their Part 32 Uniform System of Accounts ("USOA") regulatory accounting records and submit annual ARMIS-type financial reports. The requirement should be expanded to also include wire center level accounting data, similar to those that ETI had obtained through multiple data requests in the course of this study. Carriers should be required to submit these to the Communications Division on a semi-annual basis.
- **Recommendation 7:** The Commission should establish a process to proactively examine the alternatives that would be available to maintain adequate service to Frontier California customers in the event that the parent company no longer has the financial resources to provide safe and reliable services in California.

The Genesis of this Study

In December 2011, the Commission opened Rulemaking (R.)11-12-001 to (a) review telecommunications carrier performance in meeting the GO 133-C service quality standards and measures in 2010; (b) assess whether the existing GO 133-C service quality standards and measures meet the goals of the Commission to adequately protect California customers and the public interest; (c) determine whether the existing GO133-C standards are relevant to the current regulatory environment and market; and (d) determine whether there is a need to establish a penalty mechanism for substandard service quality performance. In the Scoping Memo issued the following September, the Administrative Law Judge (ALJ) and the then-Assigned Commissioner noted that:

In order to maintain acceptable levels of service quality for California customers, it is necessary to ensure that carriers have access to an adequate network of infrastructure. ... As a part of our review of the factors that may affect service quality, Communications Division shall oversee an examination of carriers' facilities. This examination will focus on the facilities of AT&T and Verizon, and will be conducted by an independent consultant under a contract managed by Commission staff. ...

In responding to the Communications Division's Request for Proposals ("RFP") from consultants to undertake this examination, ETI outlined a data-driven approach that would rely upon the extensive amount of data regularly being submitted by the two carriers as well as on various other public sources, along with the results of the Communications Division Staff's on-site inspections and carrier responses to future data requests.

Organization of this Report

This Report is organized into twelve (12) chapters, as follows:

- This Chapter 1 provides this Executive Summary of the Study, its methodology, and conclusions.
- Chapter 2 reviews the history of GO 133 and the Commission’s efforts to monitor and regulate the quality of services provided by the state’s two largest ILECs, AT&T California and Frontier California. It describes the specific GO 133-C/D performance standards and the process that the Commission has utilized to measure and monitor ILEC compliance, with a particular focus upon service outages affecting legacy voice telephone services, generally referred to as “Plain Old Telephone Service” or “POTS.”
- Chapter 3 provides an overview of the physical network infrastructures of AT&T California and Frontier California, and the two companies’ progress in upgrading their networks with fiber optic feeder and distribution plant.
- Chapter 4 is divided into three sections. The main section describes the market environment for POTS, noting how both companies, and the industry nationally, have experienced a precipitous drop-off in demand for these services over the 8-year study period. Legacy POTS residential customers have been shifting to wireline broadband services being offered by AT&T and Frontier, as well as by cable television operators such as Comcast and Charter. Legacy business voice service customers have also been shifting to competing providers, primarily those offering Voice over Internet Protocol (“VoIP”) services. AT&T and Frontier have retained some of these residential and business customers by offering similar VoIP services of their own. However the largest factor in customers migrating away from wireline voice services has been the growth of mobile wireless services.

The two other sections of Chapter 4 – Chapters 4A and 4F – examine the trouble report and out-of-service performance data compiled from the service quality reports submitted by AT&T California (Chapter 4A) and by Frontier California which includes the former Verizon California (Chapter 4F). Service quality is examined both on a companywide basis and at the wire center level, based upon five separate criteria: (1) whether or not the company invested capital to upgrade the wire center to offer high-speed broadband services, (2) wire center size based upon the number of access lines served, (3) the extent of decline in the number of access lines in service over the study period, (4) population density of the area served by the wire center, and (5) how the company provided for maintenance of the wire center. With a few specific exceptions, the quality of AT&T and Frontier legacy voice services has steadily declined over the study period, with outages occurring more frequently and service restoration times getting longer.

- Chapters 5 and 6 examine AT&T and Frontier’s policies regarding infrastructure investment and maintenance. These chapters explore the extent to which the two companies are devoting their capital and operating expense resources towards maintaining the facilities and equipment used to provide legacy POTS services. AT&T has spent little in this regard, while Frontier has not provided specific information regarding investments made for infrastructure rehabilitation.
- Chapters 7 and 8 examine parent company corporate investment policies at a general level. They address the radically different levels of commitment by the two parent companies, AT&T Inc. and Frontier Communications, Inc., towards their operations in California. AT&T’s corporate focus has been directed elsewhere, towards wireless, broadband, and video distribution and content. Frontier purchased Verizon California in 2016 as part of a three-state deal that also included Verizon’s ILEC assets in Texas and Florida. Prior to that transfer, Verizon’s attitude toward the wireline ILEC business was similar to that of AT&T and, indeed, Verizon had for a number of years been engaged in systematically divesting itself of many of its ILEC operations – primarily those that it had acquired in the 2000 Bell Atlantic/GTE merger. Frontier, on the other hand, continues to focus almost exclusively upon wireline local exchange telephone service.
- Chapters 9 and 10 examine the safety, redundancy and resiliency of the AT&T and Frontier networks, focusing primarily upon route diversity, redundancy and backup for E911 emergency calls directed to Public Safety Answering Points (“PSAPs”).
- Chapter 11 provides ETI’s overall conclusions and specific recommendations.
- Chapter 12, drafted by Communications Division Staff, provides a summary of Staff’s conclusions following a series of on-site visits to multiple AT&T and Frontier wire centers.

Chapter Summaries

2: INTRODUCTION AND BACKGROUND FOR THIS STUDY

In the Scoping Memo issued in September 2012 in R.11-12-001, the ALJ and the then-Assigned Commissioner noted that:

In order to maintain acceptable levels of service quality for California customers, it is necessary to ensure that carriers have access to an adequate network of infrastructure. Without infrastructure that is adequately maintained, customers’ services will degrade. In extreme cases, facilities failures will lead to a complete loss of service, including E911, to customers served by those facilities.

The *Scoping Memo* identified five (5) principal issue areas for initial examination:

1. Are telecommunications facilities being appropriately maintained to ensure quality of service is being, and will continue to be, provided to retail and wholesale customers?
2. How have telecommunications corporations performed since 2009, relative to the service quality standards adopted in GO 133-C?
3. Are telecommunications companies providing reliable services of sufficient quality to ensure public safety and meet Commission directives and fulfill their obligations under state law?
4. Are existing service quality standards and reporting requirements reasonable, appropriate, and/or sufficient to ensure that California consumers receive adequate service and support public safety?
5. If new service quality standards are adopted or existing standards are maintained, should enforcement mechanisms such as financial penalties apply when telecommunications carriers fail to meet those standards?

This study has focused in particular upon two main GO 133 service quality standards:

- (1) *Customer Trouble Reports (CTR)*: A maximum of six (6) trouble reports per 100 working lines for reporting units with 3,000 or more working lines, eight (8) reports per 100 working lines for reporting units with 1,001-2,999 working lines, and ten (10) reports per 100 working lines for reporting units with 1,000 or fewer working lines (§3.3(c)).
- (2) *Out-of-service (OOS) repair interval*: Measured by taking the total number of the repair tickets restored within less than 24 hours divided by the total outage report tickets. The minimum standard is to repair 90% of all out of service trouble reports within 24 hours (§3.4(b), (c)).

The first of these requirements is so easily satisfied that it has never been missed by either of the two ILECs even as their overall service quality has deteriorated. It is our conclusion that the CTR standards need to be revised downward. The incidence of just under 6%, 8% or 10% of all access lines in service (depending upon wire center size) experiencing failures that would result in the creation of a trouble ticket in any given month could not be considered to constitute “good” or “acceptable” service quality. Indeed, when viewed on an annual basis,

and assuming that no single customer experiences more than one trouble condition in any given year, these standards would allow ILEC trouble reports per 100 access lines of as high as 72%, 96%, and 120% for the three wire center size categories, respectively, each year.

The requirement to clear a minimum 90% of out-of-service reports within 24 hours has never been met by AT&T since 2010. Verizon/Frontier met the OOS standard in only two of the 96 months covered by this study. In D.15-12-005, the decision approving the sale of Verizon California to Frontier, the Commission noted that “Verizon consistently failed to meet the Commission’s standard for OOS repair intervals and its performance on this metric worsened over time” and required that prior to closing the transaction, “Verizon shall fully comply with GO 133-C and complete a minimum of 90% of out of service repairs within 24-hours of receiving notice of the out of service condition.” With a powerful \$10.5-billion financial incentive to achieve the required compliance, Verizon managed to meet this condition. However, this brief two-month result appears to be an anomaly, because Frontier has consistently failed to achieve the OOS cleared within 24 hours standard for the remainder of 2016 and 2017.

3: CALIFORNIA ILEC NETWORK OVERVIEW

Both AT&T California and Frontier California provide legacy basic wireline voice services utilizing circuit switching and outside plant facilities that have been in place for several decades or longer.

Central office switches. The two companies’ switching and local distribution area infrastructures rely upon what (in other contexts) might be viewed as ancient technology. Both companies’ central office (CO) switches are between 15 and 30 or more years old and are out-of-date by several technology generations. AT&T’s CO switch entities have a combined capacity of 18.8-million voice dial connections, roughly seven times the number of switched access lines in service as of the end of the study period. Frontier’s switch entities have a combined capacity of 3.3-million voice dial connections, roughly four times the number of switched access lines in service as of the end of the study period. Many of the switches still in service were initially acquired and installed more than three decades ago, with all but one switch acquisition pre-dating the 2006 AT&T Corp./SBC merger. All of Frontier’s central office switches pre-date its 2016 acquisition of Verizon California. These machines are for the most part, second generation stored program control digital electronic switches built in the mid-1980s and 1990s. In almost any other application, such vintage hardware would have been replaced years or even decades ago. AT&T’s recent central office switch plant additions have been mainly for packet switches – about \$3.1-billion over the study period – with no significant additional investment in legacy circuit switch technology.

Packet switches are ideally suited for such broadband applications as VoIP, high-speed Internet access, and IPTV, but are generally not being used to support legacy POTS services.

Distribution facilities. The two companies have adopted very different approaches to their local outside plant distribution networks that connect individual customer premises to the carriers' central offices (wire centers). AT&T's outside plant distribution network is still largely copper-based. AT&T utilizes mainly twisted-pair copper in its distribution infrastructure, extending fiber optic cables only to "Nodes" in individual neighborhoods. This is done in order to reduce the physical length of the copper segment and allow the provision of Digital Subscriber Line (DSL) at higher speeds than would be possible if the copper loop spanned the entire distance from the wire center facility to customers' homes. 48.9% of the homes covered by AT&T are served by this "Fiber-to-the-Node" ("FTTN") network architecture. AT&T has deployed some Fiber-to-the-Premises ("FTTP") facilities in a small number of wire center areas and, where deployed, to only a small number of customer locations. FTTP technology is currently available to only about 315,000, or 1.8%, of the nearly 17.8 million homes within AT&T California's operating areas. Although these fiber upgrades are intended to support broadband services, they are also used for POTS in some cases, and such use may result in improved POTS service quality.

Verizon, on the other hand, had been deploying FTTP facilities beginning around 2006 to support its *FiOS* brand broadband service offerings. By the April 2016 date when Frontier acquired Verizon California, FTTP facilities deployed by Verizon were available to about 38% of the total population in areas served by the company. By the end of 2017, Frontier had expanded its FTTP availability to more than two-thirds of all people living in Frontier-served areas.

4: ILEC RESPONSES TO SERVICE OUTAGES

Chapter 4 is organized into three sections. The first provides a general overview of the Commission's Customer Trouble Report and Out-of-Service reporting requirements, the types of data submitted by AT&T California and by Frontier California (formerly Verizon), as well as ETI's methodologies for analyzing the companies' submissions. The second and third sections provide detailed analyses of AT&T and Frontier performance in the Customer Trouble Report and Out-of-Service standards over the 2010-2017 study period.

GO 133-C/D requires AT&T and Frontier to provide the underlying ("raw") trouble report data for every customer reported billing and non-billing related call. The companies use this raw data to prepare the required quarterly service quality reports. AT&T submitted approximately 6.1-million individual trouble report records during the January 2010-December 2017 study period, of which roughly 5.0-million were identified as Out-of-Service ("OOS") conditions of varying lengths. Prior to Frontier's 2016 acquisition,

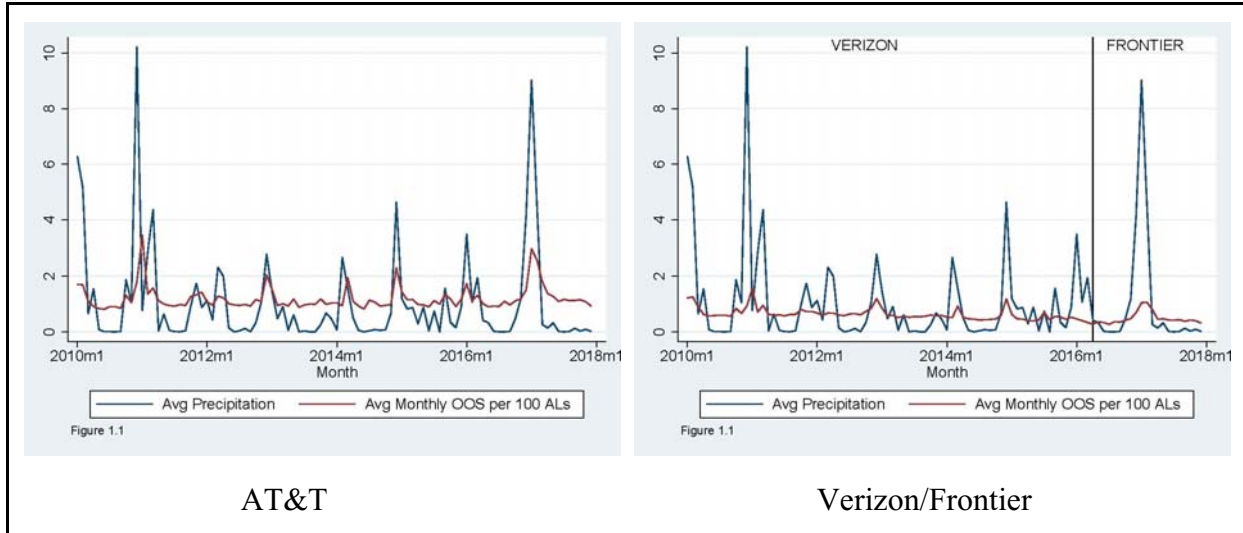


Figure 1.1. Precipitation and service outages in the greater Los Angeles area.

Verizon California had submitted approximately 1.6-million individual OOS reports through December 2015. After the completion of the transaction in April 2016, the new Frontier California provided the Commission with the last three months of Verizon’s out-of-service records (approximately 200,000), and through December 2017 has submitted approximately 1.5-million additional records covering its own ownership period.

Demand for residential POTS has declined significantly over the past decade due to the growth of alternative wireline and wireless services. The number of POTS lines in service and the total number of trouble reports decreased over the full 8-year study period. AT&T lines in service and trouble reports decreased at similar rates. However, for Verizon/Frontier, the relative decrease in trouble reports was greater than the drop in POTS lines, indicating a net improvement in service quality when viewed on a per-access line basis.

External factors affecting service quality. The number of OOS reports the companies experienced varied widely on a month-to-month basis. One of the key factors in these fluctuations are outside weather and other environmental events. After analyzing the service quality data from AT&T and Frontier/Verizon, ETI identified a strong relationship between the level of precipitation and the number of service outages. This compels the conclusion that both carriers’ networks are not as robust as they should be. Significant weather events are a fact of life in California. While the exact location and timing cannot be known in advance, weather events can be anticipated to a certain degree and taken into consideration in developing engineering, design and construction, as well as ongoing preventive maintenance practices. Utility networks need to be built so as to withstand multiple types of significant weather conditions, many of which are entirely predictable.

4A: SERVICE QUALITY PERFORMANCE – AT&T CALIFORNIA

AT&T California’s service quality and performance with respect to the GO 133 C/D metrics have deteriorated since the beginning of the study period in 2010. As shown on Figure 1.2, during the study period AT&T has never met the GO 133-C/D requirement that 90% of service outages be cleared within 24 hours. AT&T has, however, met the Customer Trouble Reports per 100 access lines standard in every month. ETI examined AT&T’s level of compliance with the OOS standard, as well as the length of time it took for AT&T to clear 90% of its outages. As shown on the plotted (red) trend line, over the 8-year study period, AT&T has shown a slight improvement in the percentage of outages cleared within 24 hours, but has consistently failed to meet the minimum 90% standard.

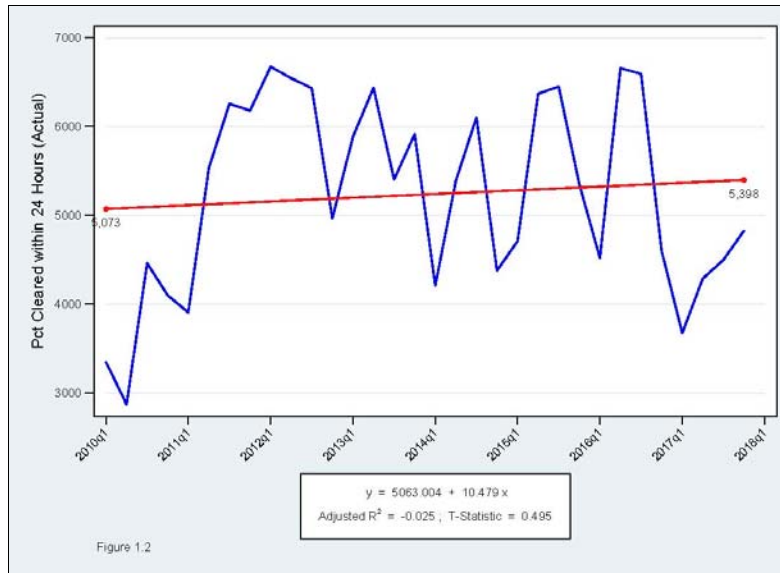


Figure 1.2. AT&T California has not come even close to meeting the GO 133 requirement that 90% of outages are to be cleared within 24 hours.

AT&T California’s response to competition for POTS service: “Harvest” those customers that remain.

While legacy circuit-switched POTS service has steadily declined in recent years, many customers steadfastly retain their POTS lines for several reasons, such as insufficient competitive alternatives, being able to retain service during a power outage, or simply customer inertia. If the overall market for POTS was sufficiently competitive, we would expect the greatest loss in customer demand to occur in wire centers exhibiting the poorest service quality. However, the opposite appears to be the case, suggesting that AT&T’s POTS customers are its lowest priority.

AT&T appears to have adopted a “harvesting strategy” for its legacy POTS services. The company has ceased active marketing of POTS, has degraded POTS service quality, and instead relies upon successive price increases and customer inertia to maintain its

declining POTS revenue stream. AT&T has increased monthly rates for residential service by 152% since 2006, made minimal investments in outside plant rehabilitation, and has also allowed service quality for its legacy services to decline. Notably, despite a 72% decrease in demand for POTS services over the 2010-2017 study period, as a result of these massive rate increases and the successful migration of customers to other (nonregulated) services, total AT&T California revenues fell by only 11.04% over the same period.

Sources of variation in service quality performance

In addition to examining service outages on a companywide basis, ETI also analyzed service outages in groups of individual wire centers according to the following five attributes: (1) investment in facilities upgrades, (2) wire center size, (3) drop-off in access line demand, (4) population density, and (5) the AT&T maintenance organization responsible for the wire center.

(1) Effect of investment in facilities upgrades. AT&T has deployed fiber optic facilities in roughly half of its California wire centers. While these are primarily in the feeder plant supporting a Fiber-to-the-Node (“FTTN”) architecture, the fiber has facilitated the availability of various AT&T high-speed broadband offerings. The presence of fiber in any given wire center indicates that AT&T has made capital investments in that area. In general, wire centers that have been upgraded with fiber facilities performed noticeably better in all GO 133 service quality metrics. In non-fiber wire centers, the long-term trend of monthly OOS incidents significantly increased. Fiber-equipped wire centers also experienced a rise in the number of OOS incidents, but at a lower rate than those wire centers where no fiber investments have been made. Notably, while the decision to invest in fiber has been driven primarily to support AT&T’s various broadband service initiatives, service quality gains realized by POTS customers has been an important, if not ancillary, benefit.

(2) Wire Center Size. While there has been an increase in the number of out-of-service reports per 100 POTS lines in all wire center size categories, the largest consistently outperform the smaller wire centers with respect to the various GO 133-C/D metrics. The largest wire centers also exhibit the highest percentages of all outages cleared within 24 hours (unadjusted) and the fewest number of days to clear 90% of all out-of-service incidents (unadjusted).

(3) Access line losses over the study period. The extent of decline in AT&T POTS lines over the full 8-year study period varied widely across individual wire centers, from a low of 5.1% in the Sierra City wire center to a high of 85.3% in Palmdale East. Large losses in POTS lines likely resulted in a reduction of maintenance personnel, impacting the Company’s ability to respond to OOS situations. Alternatively, a large drop in the number of working lines could result in additional spare capacity that might be available for rapid deployment to replace defective plant. However, persistent and

increasing service quality problems likely would contribute to more customers shifting to alternative services or providers.

Notably, the wire centers with the lowest rate of POTS line losses had experienced the largest increase in the frequency of outages per line. Wire centers with POTS line losses in excess of 80% show virtually no change in the average duration for outages exceeding 24 hours. For wire centers experiencing the smallest rate of line loss, outage durations exceeding 24 hours increased significantly.

(4) *Population density – Urban/Suburban/Rural.* AT&T’s responses to out-of-service conditions has generally deteriorated, except in the most densely populated areas. The number of OOS reports per 100 lines (unadjusted for certain excluded conditions) has been increasing except in the wire centers located in the most densely populated areas. The average duration of outages exceeding 24 hours, on an unadjusted basis, has increased in all areas. The percentage of all outages being cleared within 24 hours remains lowest in the least densely populated areas. Finally, the number of days required for AT&T California to achieve the objective of clearing 90% of OOS conditions has increased, except in the most densely populated urban areas.

(5) *AT&T Maintenance Organization.* AT&T California’s principal network maintenance organization, *Technical Field Services West (Core)*, (“TFS”), “is responsible for the installation and repair of Legacy and IP voice and broadband data services (from central offices, through outside cable plant, terminals, and to the customer premises), as well as network infrastructure support and maintenance of those same central office and outside cable plant network facilities.” The Los Angeles/Bakersfield and San Gabriel districts, both of which serve wire centers in the greater Los Angeles metropolitan area, have shown significant improvements in the OOS metric. The poorest performing TFS Districts are the Bay/Central Valley and the Northern California districts.

The unadjusted average duration for outages lasting more than 24 hours almost doubled in the Northern California TFS district. The Bay Area/Central Coast TFS District fared only slightly better. Both the San Gabriel and Los Angeles/Bakersfield TFS Districts showed significant improvement in their percentage of unadjusted outages cleared within 24 hours, as well as in the number of days it took them to meet the 90% cleared objective. The Northern California and Bay Area/Central Coast TFS Districts, on the other hand, performed the worst among the five Districts in both of these metrics.

Notably, the differences in performance among the five TFS Districts may be explained by the amount of money being invested in fiber optic facilities for each of these areas. However, while investments in wire center upgrades may account for an overall service quality improvement, it is not clear why those Districts with the smallest percentage of wire

center upgrades have experienced so substantial a degradation in service quality over the study period from 2010-2017.

4F: SERVICE QUALITY PERFORMANCE – VERIZON/FRONTIER CALIFORNIA

The company now known as Frontier California, existed as Verizon California for 75 of the 96 months covered by this study, January 2010 through March 2016. Differences in the two companies' data collection and reporting methods created challenges in our attempt to provide a comprehensive assessment of their performance over the full 8-year study period.

Verizon/Frontier Service Quality Performance

The percentage of out-of-service incidents decreased by 88.3% from 2010-2017, while the number of POTS lines in service decreased by 68% over those same eight years. Thus, unlike AT&T, the Verizon/Frontier data suggests a significant decrease in the relative number of out-of-service reports over the study period.

Duration of out-of-service incidents

The average duration of all service outages had been steadily declining under Verizon's ownership, but then spiked immediately following Frontier's takeover. However, over the next several quarters, OOS durations have once again been trending downward. The average duration for those outages extending beyond 24 hours increased during the Verizon ownership period, but have also shown improvement under Frontier.

Out-of-service incidents cleared within 24 hours

The average duration of all Verizon/Frontier OOS reports decreased over the 2010-2017 study period. However, with the exception of the two months immediately preceding the transfer of control from Verizon to Frontier, neither Verizon nor Frontier had ever met the GO 133-C/D requirement to resolve a minimum of 90% of outages within 24 hours. Their ability to clear OOS incidents within 24 hours varied widely, with Verizon's OOS repair percentage remaining relatively constant, whereas Frontier's performance in the OOS metric saw improvements.

As with AT&T, ETI's other approach to examining the requirement to clear 90% of outages within 24 hours is to calculate the average length of time it took for Verizon and Frontier to reach the 90% benchmark. On an adjusted basis, the number of days required to clear 90% of outages decreased slightly under Verizon, but then increased after the Frontier acquisition. In the first quarter of 2011, Verizon took 3.26 days to meet the 90% cleared requirement, spiking in mid-2016 immediately following Frontier's takeover.

Over the entire 8-year study period, it was only in the final two months before Frontier completed its acquisition that Verizon California succeeded in meeting the GO 133 OOS requirement to resolve a minimum of 90% of outages within 24 hours. As a condition of its approval of the sale, the Commission required Verizon to meet the OOS standard in the final months before Frontier could complete the transaction. While neither company has satisfied the requirement to resolve 90% of outages within 24 hours, it generally took fewer days for Verizon/Frontier to meet the 90% benchmark than for AT&T.

Sources of variation in service quality performance

As with AT&T, ETI constructed five different attribute dimensions. This analysis produced several important conclusions.

(1) Effect of investment in facilities upgrades. Verizon, and subsequently Frontier, have been deploying a Fiber-to-the-Premises (“FTTP”) architecture to support the offering of *FiOS*, the Verizon-branded high-speed broadband service that provides voice, Internet access, and IPTV. The fact that a particular wire center has been upgraded to FTTP indicates that Verizon/Frontier had made capital investments in that location. By the end of the study period, some 67% of Frontier’s wire centers have received FTTP upgrades. Using FTTP availability as a surrogate for capital investment, the availability of FTTP in any given wire center area has had a positive impact upon POTS service quality. Upgraded wire centers experienced a lower number of OOS incidents per 100 POTS lines in service, they had a shorter average duration, and the percentage of outages cleared within 24 hours was higher than those wire centers without broadband.

(2) Wire Center Size. All wire centers, except those serving 20,000 or more lines, experienced a decline in service quality performance over the study period. These smaller wire centers experienced an overall increase in the number of OOS reports, a larger percentage of OOS incidents lasting longer than 24 hours, as well as the an increased number of days to resolve 90% of their outages.

(3) Access line losses over the study period. Prior to Frontier’s acquisition, Verizon’s POTS access lines dropped from 2.78-million in January 2010 to 1.29-million at the end of 2015. By December 2017, active POTS lines had decreased to only 724,752, a drop of 73.9% over the full 8-year study period. Those wire centers with the greatest loss in POTS lines experienced service quality improvement both in the number of OOS incidents and in their average duration. Wire centers with the smallest decrease in POTS lines fared far worse in terms of most service quality metrics. The deterioration in service quality in these small wire centers, generally serving communities with the fewest number of competitive providers, suggests that the company has been devoting more of its resources and efforts to those communities most impacted by competition for traditional POTS services.

(4) *Population density – Urban/Suburban/Rural.* Under Verizon, OOS incidents occurred less frequently and were cleared more quickly in the largest urban wire centers. All five categories of population density improved in three of the four service quality metrics. The number of out-of-service reports per 100 access lines decreased, with the largest decreases occurring in the most densely populated areas. The average OOS duration decreased, except for the lowest density areas, where it remained the same. The percentage of outages cleared within 24 hours got worse in the three lowest density categories, but remained constant in the two categories of wire centers with the highest population densities. However, for those outages not cleared within 24 hours, the number of days required to clear the 90% benchmark improved in all five categories of population density, with the largest improvements being in those wire centers with the highest population density. Due to the relatively short period of time available for study following Frontier’s acquisition of Verizon through the end of 2017, Frontier’s results during this 21-month period of Frontier ownership are inconclusive.

(5) *Frontier Maintenance Organization.* Frontier has established six “Operating Areas” (“OPAs”) that it has designated as Beach Cities, Coastal, Desert, Gateway, Inland, and Northern. There is considerable variation in the out-of-service performance across the six operating areas. However, one possible explanation for these variations may relate more to the geographic location of the wire centers in each OPA, rather than to any inherent differences in OPA management. For example, wire centers within the “Beach Cities” and “Coastal” OPAs have higher density populations, while the Northern California OPA generally covers the lower densely populated wire center areas.

5: INFRASTRUCTURE POLICIES AND PROCEDURES: AT&T

Over the full 2010-2017 study period, AT&T California’s total Gross Plant Additions (covering all Telecommunications Plant in Service (“TPIS”) categories) amounted to \$10.16-billion. However, AT&T California has directed only a small portion of its total capital and maintenance spending toward its legacy circuit-switched voice services. Less than 1% of all AT&T capital spending on network plant additions was for outside plant rehabilitation projects. AT&T Construction and Engineering (C&E) outside plant rehabilitation projects, identified by AT&T, involved plant additions of just under \$47-million. Thus, when taking the full eight-year period into consideration, AT&T California devoted only 0.46% of its network capital investments to POTS-related outside plant projects.

A correspondingly small portion of total maintenance expenses was directed toward outside plant rehabilitation. AT&T provided data on maintenance costs incurred by its Technical Field Services (TFS) organization on OSP rehabilitation projects, but only for five years, 2013 through 2017. According to AT&T, aggregate TFS spending on OSP rehabilitation over the five-year period was \$30.9-million. However, over that same

period, total AT&T California maintenance outside plant expenses totaled \$3.57-billion. The TFS Rehabilitation projects described by AT&T as POTS-related thus amounted to only 0.86% of their total outside plant maintenance costs over from 2013-2017.

The investment and maintenance data is consistent with our finding that service quality and responses to out-of-service incidents have largely been declining. The exception to this is with those wire centers that have received fiber optic plant upgrades that support VoIP, broadband internet access, and video (IPTV) services. Thus, the only areas where AT&T has maintained POTS service quality at consistent levels over the study period are those where the company has invested in these revenue-driven advanced services. The potential for new revenues from these services, rather than the threat of fines or other regulatory measures in response to deteriorating service quality, appears to be a stronger incentive for AT&T to make capital investments in its network.

6: INFRASTRUCTURE POLICIES AND PROCEDURES: VERIZON/FRONTIER

A substantial portion of the ongoing management and operation of the Verizon California entity was carried in several “centralized service organizations” – subsidiaries of the parent company that assumed specific areas of responsibility for management and certain specific functions of the various Verizon ILECs nationwide. In its assessment of the economic efficacy of the proposed purchase of the three Verizon entities in California, Texas and Florida, Frontier had concluded that the inter-corporate transfer payments Verizon had been extracting from its ILECs in these states for centralized affiliate services were excessive, and that Frontier could realize significant cost savings by transferring these functions to its own organization.

Frontier anticipated potential annual savings of some \$700-million by year 3, due primarily to the avoidance of certain Verizon “allocated costs” associated with the affiliates furnishing centralized services furnished to the three Verizon entities. The process of transferring these functions to Frontier, which began when Frontier completed its acquisition of Verizon in April 2016, likely contributed to the various transition problems in the immediate aftermath of the transfer of control to Frontier.

Frontier California’s Outside Plant Maintenance, Inspection, and Repair Programs

Frontier provided only a general overview of its maintenance and inspection practices in its “Outside Plant Maintenance, Inspection, and Repair Programs,” which by themselves teach little about the actual extent to which the company follows these practices, priorities and performance metrics. Four specific programs are identified:

- *Maintenance programs*, consisting of (1) a Copper Rehabilitation Program that tracks trouble areas and aids in identifying copper plant for repair and replacement, and (2) the California Copper Rehab website, which also tracks issues that require repair or replacement

and (3) Pole Maintenance.

- *Quality Inspection Program*, which is described as a long-standing quality inspection program intended to proactively identify and repair problems with outside plant.
- *GO 95 Inspection and Maintenance Program* addressing the design, construction, maintenance and safety requirements for electrical and communications aerial plant, specified at GO 95, Rule 18.
- Maintenance of Underground Facilities in Accordance with General Order 128.

Fiber-to-the-Premises upgrades

While the investments in Fiber-to-the-Premises distribution plant made by Verizon and Frontier cannot be directly attributed to individual wire centers, we do know that Frontier has considerably expanded the availability of FTTP and *FiOS* services. As of the April 2016 closing date, Verizon had upgraded 55 wire centers with FTTP distribution facilities. Frontier has since expanded that deployment to another 59 wire centers, bringing the number of *FiOS*-capable wire centers to 114. At the end of 2017, some 68.4% of the population in areas served by Frontier California were capable of being served via FTTP distribution facilities. In the non-FTTP portions of Frontier's operating territory, about 900,000 people (23.8%) live in areas where Frontier offers some form of broadband, and the approximately 300,000 remaining customers have no access to any type of broadband service.

7: AT&T CORPORATE AND CALIFORNIA ILEC INVESTMENT POLICIES

Over the 2010-2017 period, AT&T Inc. has experienced significant growth in its overall gross revenues. The primary sources of this growth include wireless services, where the number of AT&T Mobility connections nationwide grew by 41.2% between 2010 and 2016 and from acquisitions, primarily from DirecTV. The 2018 acquisition of Time Warner will push AT&T Inc.'s revenues up even further. As a result, AT&T senior management's interest in its legacy wireline operations has largely been supplanted by its wireless operations and the recent satellite TV and video content acquisitions.

AT&T California revenues, on the other hand, have moved in the opposite direction. In 2010, AT&T California gross revenues were \$9.70-billion, dropping to \$8.63-billion in 2017. The California ILEC's share of AT&T Inc.'s total revenues has fallen by an even greater amount, from 7.80% in 2010 to 5.37% in 2017.

As its revenues from wireline services have diminished, AT&T California's investments in its local network infrastructure have also been decreasing. AT&T has been consistently disinvesting in its California local network infrastructure. Cumulatively, over the full 8-year

period, AT&T California had total net after-tax income of \$3.4-billion, but paid out \$7.6-billion to its parent company, AT&T Inc, thereby eroding the California company's capital base by roughly \$4.2-billion and impairing its ability to maintain and upgrade its aging infrastructure. The parent company has also been investing less in its infrastructure than its annual depreciation accruals and retirements – a policy that facilitates the payment of dividends that exceed earnings.

AT&T California's Gross Telecommunications Plant in Service ("TPIS") remained relatively constant, at between \$38- to \$41-billion over the 2010-2017 study period. However, total Gross Plant Additions were exceeded by the total depreciation accruals over the corresponding period, representing a net disinvestment of \$2.33-billion. In addition, some \$11.55-billion in retirements occurred, more than 43% in 2017 alone, bringing net TPIS down to only \$5.06-billion.

But even AT&T California's nominally reported revenues, expenses and net income cannot by themselves provide a complete or accurate picture of the company's financial performance. The AT&T California ILEC entity engages in extensive intra-corporate purchases from and sales to a number of other AT&T affiliates. Since both the seller and buyer are wholly owned by the same parent company, the nominal transfer price at which these transaction take place has little or no effect upon the parent company's bottom line. However, if the parent company's goal is to extract revenue from AT&T California, setting an inflated transfer price can accomplish this as effectively as making a dividend payment to the parent, but with far less exposure. In four out of the last five years, more than 50% of AT&T California's total operating expenses net of depreciation and amortization were paid to other AT&T affiliates for services rendered.

Persistent disinvestment, extensive affiliate transactions at self-serving transfer prices, extraordinarily large rate increases, and deteriorating service quality all point to "harvesting" as AT&T California's overarching strategy for its legacy services and customers. Moreover, those capital investments that AT&T has made in its California ILEC have not been directed toward legacy basic voice services. AT&T's "harvesting" philosophy explains why the ILEC has failed to improve service quality for its legacy services at least to the point where the GO 133-C/D standards can be achieved. The potential gains that AT&T California can realize by raising prices and curtailing investment and maintenance expenditures far exceed any financial penalties it might suffer from persistently poor service quality.

8: VERIZON/FONTIER CORPORATE AND CALIFORNIA ILEC INVESTMENT POLICIES

There are stark differences between Frontier and AT&T with respect to each of the two ILECs' financial situation and their respective ability and willingness to invest in the ongoing maintenance and upgrading of their California local service infrastructure. Whereas AT&T's legacy ILEC operations are increasingly less important to the parent company, Frontier's primary, if not only, goal is the success and profitability of the ILECs in its nationwide portfolio. Thus, whereas AT&T has the financial resources, but not the interest, in maintaining and

upgrading its local wireline network, Frontier has a strong interest in pursuing such upgrades, but lacks the financial wherewithal to undertake all that is required.

Frontier has been operating under significant financial stress for the past several years. Frontier last posted positive earnings per share in the first quarter of 2016, and has been posting losses for every quarter since then. Frontier has been hemorrhaging customers in all major service categories across all of its 29-state footprint since its last major acquisition in 2016.

Each of Frontier’s ILEC acquisitions produced a large, one-time spike in revenues from its newly-expanded customer base, followed in each instance by revenue erosion from the new immediate post-acquisition level – producing a sort of “sawtooth” effect. Frontier’s expansion/acquisition strategy of pursuing a succession of large ILEC acquisitions into a market that was already in a steep decline was, at the very least, ill-timed.

Frontier spent some \$22.4-billion on its various acquisitions, which had been financed by \$10.5-billion in new equity and some \$11.9-billion in new debt. By the end of 2017, Frontier’s total debt had reached nearly \$17-billion. Frontier’s annual debt service (interest and amortization) had, by 2017, escalated to \$1.9-billion. Together with the persistent drop-off in customers and revenues, this resulted in severe cash flow challenges and major earnings erosion despite the revenue growth overall. At year-end 2017, Frontier’s debt-to-revenue ratio was 1.86. Frontier’s cost of debt now averages 8.99%, well into the junk bond range. Thus, some \$1.5-billion out of the total \$1.9-billion in annual debt service represents interest on that debt. Total 2017 debt service payments account for some 20.8% of total Frontier 2017 operating revenues.

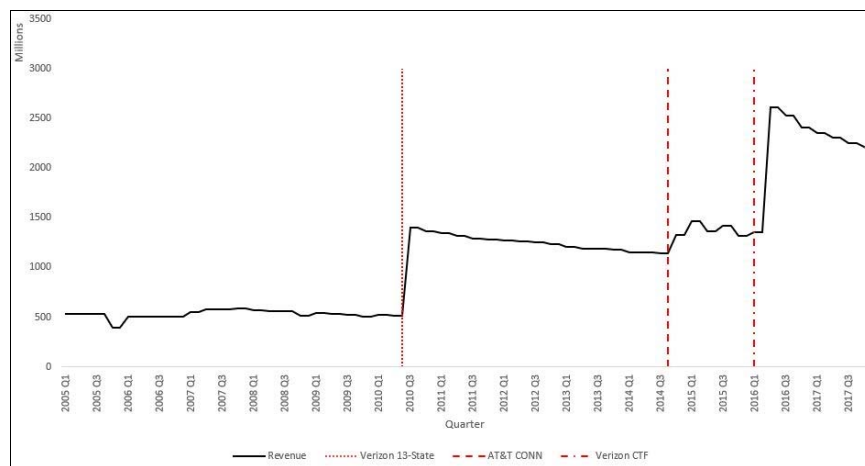


Figure 1.3. Each of Frontier’s major ILEC acquisitions produced a large, one-time revenue spike followed in each instance by revenue erosion during the immediate post-acquisition period, producing a sort of “sawtooth” effect.

Frontier’s net income declined following each successive acquisition, to the point where it

has now been negative for seven consecutive quarters. Frontier’s shareholders have come to understand that Frontier had grossly overpaid Verizon for the three ILECs purchased in 2016, and have discounted the value of the company’s stock far below its nominal book value.

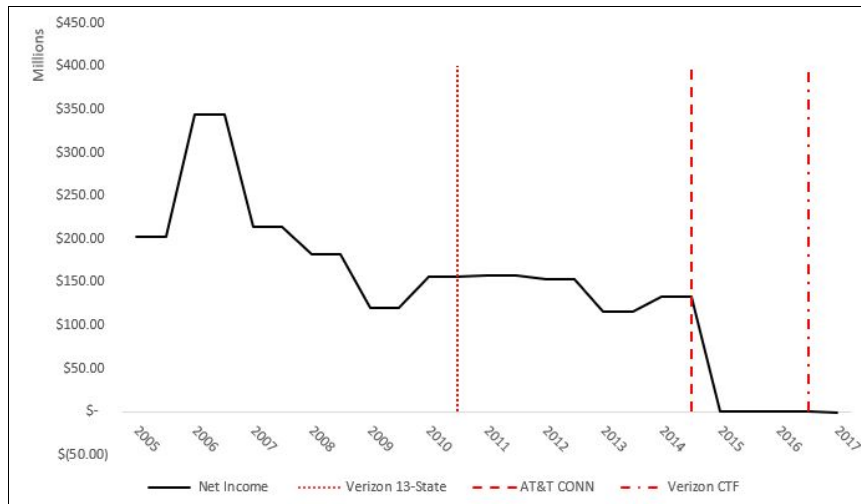


Figure 1.4. While its various acquisitions produced large increases in the number of customers and total operating revenues, their impact upon Frontier’s net earnings was a succession of steep declines. [Source: Frontier 10-K Reports 2005-2017].

Still, Frontier California remains the underlying provider of most retail local network services offered within its service area. In addition to legacy POTS-type circuit-switched services, the scope of Frontier California’s direct retail offerings also includes bundles of voice, high-speed Internet access and video marketed under the *FiOS* brand.

Verizon California and post-acquisition Frontier California have not implemented the extreme succession of significant price increases for its legacy residential POTS services. And unlike AT&T, there is no evidence of a “harvesting strategy” on the part of Frontier or even Verizon before the transfer. Frontier, as a “pure-play” ILEC, has a strong incentive to maintain and to grow its customer base, not to allow it to dissipate. These are all positives for Frontier’s future if it is somehow able to reverse its financial decline.

Unlike Verizon California’s diminishing importance to its parent company prior to the 2016 sale, Frontier California represents a major component of its new parent, Frontier Communications Corporation. But with the parent company’s worsening financial condition, Frontier California’s financial condition and investment policies will be dictated by conditions that are largely beyond the CPUC’s control.

9: ASSESSMENT OF SAFETY, REDUNDANCY AND RESILIENCY OF NETWORK(S): AT&T

Central office route diversity

Most AT&T California central offices that serve end user customers (known as “Class 5 central offices” or “end offices”) are connected to the public switched telephone network (“PSTN”) via a single physical transport facility linking the end office to another switching facility within the local network, usually a so-called “ tandem” switch. Tandem switching functions may be housed in a stand-alone switch entity that performs only these interoffice connections, but are often combined with end office functions in the same physical switch.

While there is extensive redundancy and routing diversity designed into the interoffice and interexchange levels of the PSTN, in most cases there is only a single connection between an individual Class 5 end office and the tandem switch that serves as a gateway to the rest of the world. If that connection is interrupted, the connection from that end office to the PSTN is severed, thus isolating the end office and its customers until a repair can be made. AT&T has identified a total of 36 central offices that perform tandem switching functions and have any physical and/or logical diverse connections to the PSTN. No Class 5 end offices that do not also perform tandem switching functions were identified as having any such physical or logical route diversity.

PSAPs

A “Public Safety Answering Point” (“PSAP”) is a facility that receives emergency “9-1-1” type calls and dispatches police, fire, medical or other emergency assistance as needed. In California, PSAPs are typically operated by a local city, county or other government entity and serve defined geographic areas. PSAPs are supported by a customer database, so when a 9-1-1 call is placed from a legacy wireline or fixed VoIP telephone line, the calling number, associated customer name, and location data are displayed at a 9-1-1 operator terminal.

Routing 9-1-1 calls to the applicable PSAP is accomplished at the wire center serving the caller’s access line. There are 368 PSAPs within AT&T California’s operating area, which are hosted by 233 AT&T wire centers. Based upon the data that AT&T has provided, there are 27 central offices hosting PSAPs that do not provide for diverse connections.

10: ASSESSMENT OF SAFETY, REDUNDANCY AND RESILIENCY OF NETWORK(S): FRONTIER

Wire Center connection redundancy

As electromechanical wire center switches were replaced by analog electronic and ultimately by digital electronic switches beginning in the mid-1980s, then-GTE consolidated groups of individual central offices that had been serving relatively small rural communities into “host/remote” configurations. Multiple “Remote Service Units” (“RSUs”) are connected to a common “host” end office switch that provides the computer processing for all of the RSUs in the group. Each RSU-host connection typically involves a single digital transport facility capable of supporting between 24 and 672 voice-grade channels, depending upon the capacity needs of the RSU and the community it serves. These individual “umbilical” links between the RSUs and the host offer no route diversity or redundancy – if the digital transport facility is interrupted, the RSU and the community that it serves are effectively cut off from the rest of the world.

More densely populated urban and suburban areas are typically served via stand-alone switches. Frontier’s network appears to offer route diversity among the individual and host central offices, but with minimal or no route diversity within each host/remote consolidation. According to Frontier, 170 out of its 270 wire centers (which includes remotes) in California currently support some type of diverse connectivity to the PSTN, although the precise details of this claim regarding route diversity have not been provided.

Public Safety Answering Points (“PSAPs”)

Because PSAPs need to be reached immediately when an emergency arises and need to provide immediate assistance, they have a special need for route diversity. There are 93 PSAPs in California which are served out of 79 wire centers. In order for a 911 call that originates from a location other than a PSAP host wire center to be completed, an interoffice connection will need to be established. This underscores the need for network route diversity. In addition, if a PSAP becomes overloaded (e.g., in the case of a natural disaster that affects large numbers of people) or becomes disabled (e.g., by the natural disaster itself), the routing of 911 calls to an alternate PSAP is necessary. Of the 93 PSAPs identified by Frontier, 41 have diverse connections, 17 have connections that are described as “Not Diverse,” 42 are shown as having “Non-FTR Segments-Inconclusive,” while three have connections that are described as “currently being reviewed.” 32 connections are described as diverse under Frontier, but are transported via a third party (e.g., by AT&T California), and it is unknown whether those connections remain diverse.

Back-up power

Frontier identified 241 central offices that are equipped with at least eight (8) hours of back-up power. FCC regulations however, specify 24 hours and a minimum of 72 hours of

back-up power for wire centers that support Selective Routers for E911 calls. Frontier did not provide sufficient data on back-up power supplies to support any conclusions as to the company's resiliency and/or ability to meet FCC regulations.

Disaster recovery

Frontier has indicated that it can mobilize resources nationwide in the event of a major emergency, but has not provided details or written practices as to the specific measures to be taken in such circumstances.

11: CONCLUSIONS AND RECOMMENDATIONS

While a substantial portion of the demand for legacy circuit-switched residential POTS services has been supplanted by alternatives – both technological and competitive – it would be wrong as a policy matter to conclude that these services have outlasted their usefulness and that ongoing regulatory attention is no longer required. The highest drop-off rates – in excess of 70% since 2010 – have occurred primarily in the most densely populated areas; substantially lower drop-off rates have prevailed elsewhere in the state. The persistence of these geographic disparities in the adoption of technological and competitive alternatives despite massive and persistent price increases compels the conclusion that, for many customers, legacy services remain essential.

Whether deliberate or not, AT&T's investment policies have tended to favor higher-income communities, and have thus had a disproportionate impact upon the state's lowest income areas. For example, the weighted average 2010 median annual household income for wire center serving areas that had been upgraded with fiber optic feeder facilities to support broadband services was \$72,024, vs. only \$60,795 for wire centers without such upgrades. Using 2010 US Census data, we find a clear inverse relationship between household income and all of the principal service quality metrics. Wire Centers serving areas with the lowest household incomes tend to have the highest trouble report rates, the longest out-of-service durations, the lowest percentages of outages cleared within 24 hours, and the longest times required to clear 90% of service outages. The opposite is the case for the highest income communities.

AT&T's record on service outages has deteriorated over the 2010-2017 period (the subject of this study). AT&T's overarching approach to its stewardship of the California ILEC infrastructure has been a "harvesting strategy" that relies upon customer captivity and inertia, rather than providing good quality service. "Harvesting" of this legacy service customer base allows AT&T to maintain revenue levels and to extract the maximum amount of capital from the California ILEC entity in order to support the parent company's wireless, video distribution, video content, and other business initiatives – activities that have captured the overwhelming bulk of management's attention.

Unlike AT&T, whose interest in its legacy wireline operations had been in decline for many

years, Frontier's only business is that of operating ILECs in some 29 states across the country. But while Frontier's priorities are in maintaining and growing its ILEC properties, the company's financial resources have become so deteriorated as to threaten its ongoing ability to pursue these priorities going forward. Frontier's common stock price has dropped by around 98% since its high in February 2015, and as of April 10, 2019 its market cap was at \$261.2-million – notably, Frontier has invested more than that in California alone over the first 21 months of its ownership. The parent company's earnings have been consistently negative since the second quarter of 2016. Its annual debt service payments are now consuming more than one-fifth of its total operating revenues, making prospects for raising additional debt or equity financing extremely challenging. It is now abundantly clear that Frontier's decision to purchase Verizon California in 2015 was both ill-timed and ill-conceived.

Frontier's current financial condition is precarious, yet its operations in California remain a critical component of the state's telecommunications infrastructure. Approximately 25% of all California ILEC legacy voice access lines are served by Frontier. Unlike AT&T, which has made minimal investments in upgrading its ILEC infrastructure to support high-speed broadband services, Verizon, and Frontier after its takeover, have been actively pursuing FTTP upgrades throughout the study period, and by the end of 2017, FTTP had become available to slightly more than two-thirds of all people living in Frontier-served areas. However, the company's ongoing financial ability to maintain and to further upgrade these facilities is in serious doubt. Under these conditions, the Commission should make the development of contingency plans in the event of a Frontier financial collapse a critical priority. This and the other specific recommendations resulting from this study are summarized at the beginning of this Executive Summary chapter.

12: COMMUNICATIONS DIVISION STAFF SITE VISITS

Chapter 12 of this report was prepared by the CPUC Communications Division staff. CD Staff conducted a series of site visits to selected AT&T California and Frontier California wire centers. Section 2.2.1 of the Request for Proposal (RFP) defined the criteria for selecting locations to be physically inspected, which included areas having out-of-service (OOS) records for periods greater than the statewide average duration, and other randomly selected areas. CD Staff focused on wire centers from both companies that had the highest number of out-of-service troubles lasting more than 24 hours per 100 access lines. Additional criteria included wire centers contiguous to poorly performing areas; wire centers benefitting from the carriers' General Order (GO) 133-D alternate investment plan; and locations where customers filed outage-related complaints with the CPUC's Consumer Affairs Branch (CAB). CD Staff completed physical examinations of the AT&T and Frontier Wire Centers identified below:

PHYSICAL SITE SURVEY LOCATIONS		
County	Wire Center	Carrier
Marin	Nicasio, Inverness, San Geronimo	AT&T
Mendocino	Boonville, Fort Bragg, Hopland, Potter Valley	AT&T
Sutter	Pleasant Grove, Nicolaus	AT&T
El Dorado	Georgetown, Placerville	AT&T
Nevada	Lake of the Pines	AT&T
San Mateo	Menlo Park	AT&T
Santa Clara	Los Altos	AT&T
Santa Clara	Los Gatos-Montebello, Los Gatos-Blossom Hill	Frontier

In advance of each site visit, CD Staff requested that AT&T and Frontier provide network maps and addresses of customer outages in order to determine areas with clusters of outages occurring closely together. At each location, CD Staff observed and documented the condition of the central office building and equipment, inquired about sufficiency of labor and staffing resources, and surveyed the overall design of the network with respect to the geographical layout of the exchange, and gathered area information from AT&T and Frontier personnel. Specific outside plant inspections focused on the pre-determined "outage clusters" or neighborhoods with high incidences of trouble reports.

CD Staff photographed outside plant facilities and other equipment that showed signs of deterioration or deferred maintenance. Common examples that might be attributed to deferred maintenance include a lack of cable guards in areas where tree branches are encroaching on cables; de-lashing of the strand on non-self-supported copper cable; improperly sealed splice closures; improper attachments of aerial plant; insufficient cable clearances between utilities on poles; excessive sagging of cables between poles; deficiencies in bonding/grounding of facilities; faulty terminal attachments; and sloppy aerial and buried cable/drop maintenance practices.

Central Office Staffing and Back-up Power Resources.

AT&T's central offices in rural exchange areas contained remote switching systems that are controlled by a host switch located at a different central office. None of the rural locations that CD Staff visited had a full-time employee stationed in the building. Technicians assigned to the district are instead rotated through buildings based on workload. The two central offices CD Staff visited in Frontier's territory each have full-time staffing.

All central offices are equipped with back-up battery systems and diesel generators. In the event of a loss of commercial power, most central offices can keep systems running for at least 72 hours, depending on call load. As long as there is fuel available to power the generator, a

central office can maintain power indefinitely.

Outside Plant Conditions and Staffing Resources.

In both AT&T and Frontier's service areas, CD Staff observed outside plant conditions that indicated a lack of maintenance as well as facilities that were observed to be in service beyond their usable lifespan. One of the most common causes of out-of-service conditions is water intrusion, primarily from rain or flooding. While precipitation is a known problem with copper facilities and rainfall in California is largely predictable, both companies should be maintaining their networks at a level that is robust enough to withstand rain, snow and other environmental conditions. Outside plant personnel reported that many troubles are also caused by conditions outside their control, such as rodents chewing on cables, vandalism, construction accidents caused by heavy equipment, overgrowth of tree branches, and lightning strikes.

Additionally, personnel from both companies indicated that AT&T and Frontier are not actively hiring or otherwise replacing technicians who retire or leave through attrition. This reduction in staffing resources could negatively impact service quality. If dispatch loads for customer troubles contain more jobs than can be cleared in a day, any unfinished jobs are pushed out to the next day thus extending the time that the customer is out of service.

Network Design and Subscriber Pair Gain Electronics. Another condition that contributed to poor service quality is the size of the area served by a central office. The wire centers visited by CD Staff in Northern California cover large geographical areas and require either long copper loops or the use of electronic pair gain systems. Subscriber loop carrier (pair gain systems) provide telephone service to areas with a high density of subscribers and can be deployed far from the central office (to serve subscribers located beyond 18,000 cable feet from the CO). These are active systems that are enclosed in cabinets, rely on commercial power, and come equipped with battery backup systems. While they are designed to be installed outdoors, they can be a frequent source of customer troubles if they lose power or in instances where the cabinet is exposed to direct sunlight and the temperature exceeds the upper design limit of the electronic components. In wire centers without fiber-fed facilities, customers that are located farther away from the serving central office (long loops) have a higher number of potential points of failure; this often contributes to a higher rate of outages and a longer duration for the out-of-service conditions to be cleared.

Principal observations and takeaways

2: INTRODUCTION AND BACKGROUND FOR THIS STUDY

- The ongoing failure of the carriers to meet the specified minimum GO 133-C/D service quality standards may warrant additional corrective measures, including revision of existing minimum standards and imposition of financial incentives and penalties.
- The GO 133 maximum Customer Trouble Report Rates of 6%, 8% or 10% of switched access lines per month (based on wire center size) are unduely generous because failure rates as high as these can hardly constitute acceptable service quality.
- The only time that either ILEC has met the GO 133-C/D requirement of 90% of out-of-service conditions cleared within 24 hours occurred during the last two months of Verizon's ownership, and only because the Commission required such compliance as a condition for approval of the sale of the ILEC to Frontier:

3: CALIFORNIA ILEC NETWORK OVERVIEW

- AT&T California's decision to retain its decades-old central office switches in service may be a practical strategy in light of the formidable economic, technology and regulatory challenges to any wholesale involuntary migration of its legacy voice service customers to current packet switched VoIP technology.
- Most of AT&T's recent central office plant additions have been for packet switches that are not used to provide legacy POTS services.
- Frontier's central office switches were all acquired before Frontier's 2016 purchase of Verizon, with the majority pre-dating the 2000 merger of Bell Atlantic and GTE. Many of the switches that are still in service were installed more than three decades ago.
- As of the April 2016 date when Frontier took over the company, FTTP plant deployed by Verizon was available to roughly 1.44-million – or about 38.4% – of the population in areas Verizon served. Since the acquisition, Frontier has added 59 wire centers serving areas with another 2.32-million people to its FTTP network and, by the end of 2017, FTTP was available to slightly more than two-thirds of all people living in Frontier-served areas.
- AT&T has never committed to deploying FTTP on a large scale, although the company has constructed FTTP at a small number of customer locations in the state. Overall, only 1.8% of homes passed by AT&T California have been upgraded with FTTP.

- Broadband upgrades provide service quality benefits to basic POTS customers, but a carrier's decision to invest in broadband is driven mainly by factors that have little direct bearing upon improving service to legacy POTS customers. California ILECs are under no legal obligation to invest in broadband, but fines imposed pursuant to GO 133-D, if scaled correctly with respect to the extent of the shortcoming, have the potential to provide the necessary incentives to encourage such investments.

4: ILEC RESPONSES TO SERVICE OUTAGES

- ETI's analysis of the condition of AT&T and Frontier's networks in California is, among other things, based upon the approximately eight million Customer Trouble Report records submitted by the two companies over the 2010-2017 Study Period.
- The source of most service outages is being attributed by the ILECs to weather-driven and other failures in outside plant rather than to their central office switches or associated equipment.
- Telephone service outages appear to be highly dependent upon weather conditions, specifically, the amount of precipitation in the area served.
- The strong relationship between rainfall and the rate of service outages provides a strong indication that the AT&T distribution network is not as robust as it needs to be, and lacks the resiliency to withstand significant weather events.
- FCC data indicate that, for California, the demand for all wireline voice services provided by all carriers combined decreased by 30.1%, from 20.9 million in 2008 to 14.6 million in 2016. During the same period, the number of wireless subscriptions in California increased by 32.7%, from 32.2 million to 42.7 million. Overall, there are 3.4 million more wireless subscriptions than the total population in California, which was 39.3 million people at the end of 2016.
- The decline in customer demand for legacy POTS over the 2010-2017 period has been greatest in the larger, more metropolitan wire center areas. These same metropolitan area wire centers also exhibit the highest levels of service quality and greatest availability of alternative wireless and broadband services.
- Over the full period, there has been a net increase of approximately 15.5% in the trend of OOS incidents per 100 POTS lines in service over the full study period.

4A: SERVICE QUALITY PERFORMANCE – AT&T CALIFORNIA

- The greatest demand drop-offs for legacy POTS services generally occurred in the largest wire centers.
- Over the 2010-2017 study period, ATT's average OOS duration over 24 hours per 100 access lines has increased by roughly 12%.
- Some individual wire centers have experienced significant increases in the incidence of out-of-service conditions that had remained uncleared after 24 hours, while in other wire centers there have been improvements.
- The trend in average duration of all out-of-service conditions, excluding those cleared within one hour, for AT&T has been steadily increasing over the study period.
- 49.6% of the roughly 5-million out-of-service conditions (46.4% on an “adjusted” basis) remained uncleared after 24 hours. To satisfy the GO 133-C §3.4(c) requirement, these percentages would need to drop to less than 10%.
- On an adjusted basis, the number of days required for AT&T to clear 90% of all out-of-service conditions ranged from a low of 1.9 (in the first quarter of 2012) to a high of 8.8 (in the first quarter of 2011). In 2017, the adjusted number of days to achieve 90% OOS cleared falls in the 5.8 to 6.7 range.
- AT&T appears to have adopted a “harvesting strategy” for legacy POTS services. AT&T has ceased active marketing of POTS and has degraded POTS service quality and its responses to trouble reports, relying instead upon successive price increases and customer inertia to maintain its revenue stream, albeit decreasing, for an extended period of time.
- Wire centers upgraded with fiber to support broadband services achieve better service quality performance scores in every category – lower numbers of Trouble Reports per Hundred Access Lines (“TRPH”), higher percentages of out-of-service conditions that are being resolved within 24 hours, and where out-of-service situations arise, their average durations are in all cases decidedly shorter.
- Broadband upgrades, for high-speed Internet, VoIP, and IPTV video services confer a direct benefit to legacy POTS customers as they are migrated to the new distribution architecture. But however these new plant upgrades and acquisitions are being utilized, there is a reasonable expectation that some overall improvement in POTS service quality should result.
- There appears to be a strong relationship between the number of POTS lines in a wire center

and the quality of service provided. The number and the rate of increase in OOS per 100 POTS lines have been lowest in the very largest (over 20,000 lines) wire centers.

- The largest increases in service outages occurred in wire centers with the lowest POTS drop-off rates; the incidence of service outages increased more slowly or remained almost constant in wire centers with successively larger drop-off rates.
- There is little effective competition for POTS services. If the market were sufficiently competitive, the greatest loss of demand would occur in wire centers exhibiting the poorest service quality, with only minimal losses where service quality is being maintained or improved. Instead, the greatest drop-off in demand occurred in wire centers with the best service quality records.
- Except in areas with the highest population density, AT&T's response to out-of-service conditions has generally deteriorated over the study period.
- Of the five AT&T maintenance (TFS) districts, LA/Bakersfield and San Gabriel have shown significant improvements in most OOS metrics. The poorest performing districts are the Bay/Central Valley and Northern California. Northern California, for example, has seen a 34% increase in the rate of OOS per 100 POTS lines in service over the study period. By contrast, the San Gabriel district saw a 16% improvement.
- Since the bulk of AT&T's investments in its ILEC network have been aimed at upgrades that support broadband services, the TFS Districts with the smallest percentage of such upgrades have experienced substantial degradations in service quality over the period. This result underscores the pressing need for infrastructure investment irrespective of AT&T's pursuit of the broadband market.

4F: SERVICE QUALITY PERFORMANCE – VERIZON/FRONTIER

- From January 2010 through December 2017, total Verizon/Frontier California POTS access lines in service dropped by 73.9%, from 2,778,584 to 724,752.
- In contrast to our findings regarding AT&T, our analysis of the data provided by Frontier indicates a noticeable improvement under both ownerships in the relative number of out-of-service cases over the same 8-year period.
- The trend in average duration of all out-of-service conditions excluding those cleared within one hour for Verizon and Frontier has been steadily decreasing over the full study period.

- There appears to be a strong relationship between the number of POTS lines in a wire center and the quality of service provided. The number and the rate of increase in OOS per 100 POTS lines have been lowest in the very largest (over 20,000 lines) wire centers.
- The largest increases in service outages occurred in wire centers with the lowest POTS drop-off rates; the incidence of service outages increased more slowly or remained almost constant in wire centers with successively larger drop-off rates.
- In areas with the highest population density, Verizon/ Frontier's response to out-of-service conditions has generally improved over the study period, compared to more rural areas.
- Of the six Frontier maintenance Operating Areas, those serving wire centers in the largest metropolitan areas (Los Angeles and Orange Counties) continue to show the best results and significant improvements in most OOS metrics. The poorest performing Operating Areas are those primarily serving rural communities.
- The Operating Areas within which most of the Verizon and Frontier FTTP upgrades have occurred have experienced the lowest number of OOS incidents and the shortest outage durations for those that do occur.

5: INFRASTRUCTURE POLICIES AND PROCEDURES: AT&T

- Over the full 2010-2017 period, less than 1% of all AT&T capital spending on network plant additions, just under \$47-million, was for outside plant rehabilitation projects.
- Extraordinarily small portions of AT&T California's Plant Additions and Maintenance expenditures have been directed at legacy POTS services over the 2013-2017 period.
- Despite the clear service quality objectives as set out at GO 133-C/D, the only areas where AT&T California has maintained POTS service quality in its network were in those wire centers where the company has invested in revenue-driven advanced broadband services.

6: INFRASTRUCTURE POLICIES AND PROCEDURES: VERIZON/FRONTIER

- In its economic assessment of the 2016 purchase of the three Verizon ILECs, Frontier had concluded that the intra-corporate transfer payments that the three companies had been making to various Verizon centralized services affiliates were excessive, and that Frontier could realize some \$700-million in annual cost savings by capturing these functions within its own organization.
- Frontier began shifting functions previously provided by Verizon service affiliates to its own organization almost immediately after completing the acquisition in April 2016. This strategy may well have contributed to many of the transition problems that Frontier had encountered.
- The general overview that Frontier has provided of its maintenance practices and policies does not provide any information as to the extent to which these policies and practices are actually being followed.
- Both Verizon and Frontier have invested heavily in upgrading and expanding Fiber-to-the-Premises (“FTTP”) services both before and after the April 2016 closing of the transaction. FTTP facilities are now available to more than two-thirds of all people living in Frontier-served areas.

7: AT&T CORPORATE AND CALIFORNIA ILEC INVESTMENT POLICIES

- AT&T California's potential revenue from raising prices and curtailing investments in its legacy POTS services far exceed any financial penalties imposed for its failure to meet the GO 133-C/D service quality standards.
- To support its “harvesting” strategy and maintain revenues despite a massive drop-off in demand, AT&T California has raised its rates for legacy flat-rate residential service by 152.6% since the service was de-tariffed by the CPUC in 2009.
- AT&T senior management’s interest in and attention to its legacy wireline ILEC operations has been largely supplanted by its wireless operations and the recent satellite TV and video content acquisitions.
- AT&T California financial statements show an incomplete assessment of the ILEC’s financial condition due to the large volume of inter-affiliate transactions made at transfer prices that are not set on the basis of arm’s length negotiations.

- Cumulatively, over the full 8-year period, AT&T California had total net after-tax income of \$3.4-billion, but paid out \$7.6-billion to its parent company, AT&T Inc, thereby eroding the California company's capital base by roughly \$4.2-billion and impairing its ability to maintain and upgrade its aging infrastructure.
- AT&T, Inc. has also been eroding its California ILEC's capital base by investing less in its infrastructure than its annual depreciation accruals and retirements.
- AT&T's "harvesting" philosophy explains why AT&T has failed to improve service quality for its POTS services at least to the point where the GO 133-C/D standards can be achieved, because the gains it can realize by raising prices and curtailing investment and maintenance far exceed any financial penalties it might suffer from persistently poor service quality.

8: VERIZON/FRONTIER CORPORATE AND CALIFORNIA ILEC INVESTMENT POLICIES

- In contrast to AT&T, which has the financial resources but not the interest in maintaining and upgrading its local wireline network, Frontier has a strong interest in pursuing such upgrades, but lacks the necessary financial resources to do so.
- Frontier's primary goal is to ensure the success and profitability of all of the wireline operations in its nationwide portfolio.
- Frontier's expansion/acquisition strategy was clearly ill-timed: Frontier was pursuing massive acquisitions into a market – wireline circuit-switched voice telephony – that was already in a steep decline.
- Frontier's precarious and highly leveraged financial structure raises serious concern as to its ongoing access to sufficient capital to maintain and upgrade its California network.
- Frontier's net income declined following each successive acquisition, to the point where it has now been negative for seven consecutive quarters.
- Unlike AT&T, which had raised its legacy flat-rate residential POTS rates by 152% since the onset of URF, Verizon's rates for this service had risen by only 31% as of the date of the sale to Frontier, and Frontier has not effected any rate increase since the acquisition.
- As a "pure play" ILEC holding company, Frontier Communications has a strong financial incentive to stabilize and grow its ILEC operations in California and elsewhere – but if it is not able to stabilize and strengthen its overall financial health, some sort of rescue may become necessary.

9: ASSESSMENT OF SAFETY, REDUNDANCY AND RESILIENCY OF NETWORK(S): AT&T

- The only AT&T central offices that provide physical route diversity to the Public Switched Network are those that also perform tandem switching functions.
- PSAPs are being hosted by only about a third of AT&T central offices and, except for those that are connected to COs that also support tandem switching functions, most PSAPs have no physical or logical route diversity to the public switched network or in their connection to the communities they serve.
- 45 AT&T central offices that host or otherwise provide connections to PSAPs fail to meet the minimum back-up power required by FCC regulations (72 hours).
- AT&T has sufficient procedures to address nationwide service outage emergencies but is unable to identify a minimum threshold for response. There is a strong basis to conclude that AT&T California lacks the resiliency to proactively withstand disasters.

10: ASSESSMENT OF SAFETY, REDUNDANCY AND RESILIENCY OF NETWORK(S): FRONTIER

- In rural areas and over a number of years, multiple stand-alone central office switches have been consolidated into “host/remote” configurations, offering minimal route diversity within each such consolidation.
- Stand-alone switches and tandem routing of interoffice calls, rather than host/remote configurations, are used in more densely populated urban and suburban areas.
- Frontier advises that 170 out of its 270 central offices in California currently support diverse connectivity to the Public Switched Network.
- 135 Frontier central offices, serving approximately 100,000 access lines, do not currently have redundant physical connections to the Public Switched Network.
- Only 41 out of the 93 PSAPs hosted at Frontier central offices currently have confirmed diverse connections.
- Frontier identified 241 central offices that have been equipped with at least 8 hours of back-up power; however, FCC regulations specify 24 or (for COs that support Selective Routers for 911 calls) a minimum of 72 hours of back-up power.

- Frontier did not provide sufficient data on back-up power reserves to support any conclusions as to Frontier's resiliency or ability to meet FCC regulations.
- Frontier indicated it can mobilize national resources in the event of a major emergency but failed to provide realistic measures of how that is accomplished.

11: CONCLUSIONS AND RECOMMENDATIONS

- Wire centers with the lowest rates of customer drop-off have experienced the poorest levels of service quality. The likely reason for this is that a large number of customers still depend upon their legacy wireline service and lack meaningful access to competitive or alternative services.
- AT&T's investments in fiber upgrades have tended to favor higher-income communities, such that wire centers that serve areas with the lowest household incomes are also characterized by the poorest service quality.
- Despite Frontier's pervasive financial challenges, its California ILEC remains a critical component of the state's telecommunications infrastructure. Roughly 25% of all legacy POTS access lines in service in California as of December 31, 2017 were being provided by one of the Frontier ILECs.

12: COMMUNICATIONS DIVISION STAFF SITE VISITS

- In some AT&T areas, outside plant technicians' reporting locations (garages) are a long distance from their assigned distribution areas resulting in long travel times to customer locations.
- Most AT&T central offices in rural areas are not staffed on a full-time basis; outside plant technicians engaged in troubleshooting must drive to the central office and perform the necessary tasks or wait for a CO technician to be dispatched.
- In rural areas served by both AT&T and Frontier, the distance from the Central Office to many users is well beyond 18,000 feet resulting in long loops or the use of electronic pair-gain equipment; both conditions require a higher level of preventative maintenance and have higher rates of failure.
- In some areas, non-management outside plant workers who leave through attrition or retirement are not replaced resulting in fewer well-trained resources.

- Cable maintenance technicians' workload has shifted from a balance of preventative maintenance work and "chasing troubles" to mostly working on customer trouble tickets.
- In rural areas, customers have fewer (if any) competitive options.

Recommendations

- **Recommendation 1:** Expand the financial penalties for carriers that fail to meet the minimum GO 133-C/D service quality standards.
- **Recommendation 2:** In an effectively competitive market, persistently poor service quality would drive customers to take their business elsewhere. Where competition is not present, fines imposed due to an ILEC's failure to meet service quality standards should be high enough so as to have the same financial consequences as poor service quality under competitive market conditions.
- **Recommendation 3:** The GO 133-C/D maximum Customer Trouble Report Rates of 6%, 8% or 10% (depending upon wire center size) of switched access lines per month are far too generous, and failure rates as high as these can hardly constitute acceptable service quality. The carriers have had little difficulty in meeting these standards, and they should be revised downward.
- **Recommendation 4:** Unless carriers can offer technically valid explanations as to how and why smaller wire centers experience the poorest service quality, the minimum GO 133-C/D standards should be applied uniformly for all wire centers.
- **Recommendation 5:** The GO 133-D fines should vary based upon the extent of a carrier's failure to meet any service quality standard, rising in magnitude as the extent of the shortfall increases.
- **Recommendation 6:** The Commission should retain its requirement that URF carriers maintain their Part 32 Uniform System of Accounts ("USOA") regulatory accounting records and submit annual ARMIS-type financial reports. The requirement should be expanded to also include wire center level accounting data, similar to those that ETI had obtained through multiple data requests in the course of this study. Carriers should be required to submit these to the Communications Division on a semi-annual basis.
- **Recommendation 7:** The Commission should establish a process to proactively examine the alternatives that would be available to maintain adequate service to Frontier California customers in the event that the parent company no longer has the financial resources to provide safe and reliable services in California.