4 ILEC RESPONSES TO SERVICE OUTAGES: PHASE 2 UPDATE

Key findings addressed in this Chapter

- ETI's analysis of the condition of AT&T and Frontier's networks in California is, among other things, based upon the approximately 7.3-million Customer Trouble Report records submitted by the two companies over the 2010-2019 Study Period.
- Our Phase 2 analysis shows a fairly consistent and pervasive degradation in both companies' service quality performance across virtually every service quality metric that we have examined.
- 16.8% of the roughly 5-million AT&T out-of-service conditions over the Phase 1 study period had been attributed to "Heavy Rain," "Weather," "Moisture," or "Wet Plant." Over the Phase 2 2018-2019 period, that number almost doubled, to 29.6%.
- The source of most service outages continues to be largely confined to weather-driven and other failures in outside plant, rather than to the ILECs' aging central office switches or associated equipment.
- Substitution of wireless for wireline services continues. FCC data indicate that, for California, total wireline voice service access lines in service (ILEC and non-ILEC, circuit-switched and VoIP) decreased by 6.23-million, down 32.72%, from 19.65-million as of the beginning of 2010 to 13.42-million as of the end of 2018. During the same period, the number of wireless subscriptions in California increased by 10.4-million, from 32.94-million connections in 2010 to 43.34-million in 2018. Overall, there were 3.9 million more wireless connections than the total population in California, which was 39.4 million people at the end of 2018.

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Introduction: Organization of this Chapter

This chapter provides an update to Chapter 4 in our Phase 1 Report to include trouble report and out-of-service activity for 2018 and 2019. On April 1, 2016, Verizon transferred ownership and control of its California ILEC operations, then known as Verizon California, to Frontier Communications Corporation. In our Phase 1 Report, we covered the full 2010-2017 study period by merging the service quality data for both the pre- and post-transfer periods. In this Phase 2 Report, we are limiting our analysis of Frontier to the 45 months from April 2016 through and including December 2019 under Frontier ownership. Our analysis of Frontier service quality is contained in Chapter 4F. Chapter 4A updates our analysis of AT&T California's service quality performance over the full ten-year 2010-2019 period.

In our Phase 1 Report, we utilized regression analysis to develop long-term trends covering a variety of service quality metrics over the full 8-year Phase 1 study period. For Phase 2, we have appended the trouble report data submitted by the two ILECs pursuant to GO 133-D to the corresponding Phase 1 datasets. Using these expanded datasets, we then extended the long-term trend calculations to cover, in the case of AT&T California, the full 2010-2019 period and, for Frontier California, the 45-month period under Frontier ownership. We have also calculated trend lines for both companies covering the 2-year Phase 2 period from January 2018 through December 2019. The various graphs that are provided each present three separate trend lines:

(1) the Phase 1 2010-2017 trend (for AT&T) and the 4/2016 through 12/2017 trend for Frontier;

(2) the Phase 2 2018-2019 trend for both companies; and

(3) the combined Phases ½ trend, covering the full 2010-2019 period for AT&T, and the 45-month 4/2016 through 12/2019 period for Frontier.

Overview of the results of the Phase 2 service quality analysis

Our Phase 1 analysis identified a mixed bag of service quality improvements as well as degradations over the 8-year Phase 1 study period, depending upon the service quality metric being examined and the category of wire centers under examination. The overall finding in Phase 2 is a fairly consistent and pervasive degradation in *both companies'* service quality performance across virtually every service quality metric that we have examined. The quantity of service outages per 100 access lines – the basic CPUC service quality metric embodied in GO 133-C/D – has been steadily increasing over the two-year Phase 2 study period, indicating a persistent, and disturbing, increase in the rate of service outages overall. The average durations of service outages has also been getting longer; both companies are taking more time, on average, to clear such outages, and the percentage of outages that are cleared within 24 hours – the target for which is specified in GO 133-C/D at 90% – has been dropping.

Our Phase 2 analysis shows a fairly consistent and pervasive degradation in both companies' service quality performance across virtually every service quality metric that we have examined.

The massive POTS access line customer losses that both companies had been experiencing over the Phase 1 study period have persisted into Phase 2. Publicly available FCC Form 477 data show that, for all California ILECs, legacy switched access lines in service have dropped by 72.6%, from 14.58 -million as of the beginning of 2010 to 3.99-million as of the end of 2018, the most recent period for which such data has been made publicly available.[1] The drop-off rate among residential customers is even greater at 81.66%, from 8.21 -million as of the beginning of 2010 to 1.51-million as of the end of 2018.[2] Proprietary data provided by AT&T and Frontier, discussed in Chapters 4A and 4F below, show generally similar conditions. Switched access line customer defections are the result of many factors – most notably competition from other voice service providers, particularly from cable television MSOs, competition from mobile wireless carriers (which include affiliates of AT&T California and of pre-transfer Verizon California), as well as from "over-the-top" Internet applications (e.g., Skype, Vonage, Ooma and, more recently from video conferencing services like Zoom, Google Hangouts, Apple Facetime) that do not involve any type ov voice service common carrier at all, other than the underlying provider of the customer's broadband access.

This massive erosion of both ILECs' legacy customer base has, of course, led to large reductions in the amount of revenue available to support – and, of particular importance to the matter of service quality – to maintain their legacy networks. However, there is considerable evidence that the ILECs themselves are largely responsible for much of this massive loss of customers. They have maintained the same anachronistic pricing structure for these services that has persisted for more than a century – geographically narrow local calling areas and high prices for calling beyond the local zone, high surcharges for many service features like call waiting and caller ID – and, at least in the case of AT&T California, have actually been steadily increasing rates for these legacy services in furtherance of a "harvesting" strategy aimed at inducing customers to migrate to higher-priced bundles of voice, broadband, video and, in some cases, mobile services. Many of the competing services to which former ILEC legacy service customers have switched have eliminated most of these layered charges. Mobile wireless services eliminated "long distance" toll-type charges decades ago, and regularly include in the base price a full suite of calling features without any additional surcharges. Indeed, the persistent degradation in POTS service quality that has become painfully evident underscores the utter lack of interest that ILEC management exhibits with respect to this entire line of business. This is not to suggest that the ILECs are themselves responsible for the full magnitude of customer defections, but they are certainly responsible for much of this pattern.

1. "State Level Subscriptions," vts_state_table_1-1.xlsx, available at https://www.fcc.gov/voice-telephone-services-report (accessed 08.20.20)

2. *Id.*

There is, to be sure, something of a chicken-and-egg situation here: Are customers abandoning legacy circuit-switched services because of the service quality degradations, or are the service quality degradations the result of the revenue losses arising from customer defections? Probably both, which points to something of a "death spiral" that, if not addressed, will ultimately lead to the demise of these services within a relatively short period of time.

One might ask, "why is this a problem?" Here's why: First, the general decline in switched access line demand is not uniform across the state. For many lower-density areas, customer defection rates are considerably smaller than when viewed on a statewide basis. Notably, business customers have retained their legacy POTS services at a higher rate than residential – this despite rising prices and deteriorating service quality. Even with the large numbers of customers who have sought alternatives to legacy circuit-switched services, there are still many who continue to take this service. Second, POTS-type services are the only category of telecommunications that retains at least some vestige of regulatory protections for consumers, generally assuring some level of service availability even in low-density and hard-to-serve areas. Yet the principal competing voice services are being offered by providers operating in highly concentrated markets. There were six national wireless carriers a decade ago; that number has now dwindled to three. Most areas of California are served by only one broadband provider -- typically a cable television MSO such as Comcast and Charter. Verizon's *FiOS* offering had been the principal competitor to the cable broadband services, but since the transfer of Verizon's California ILEC operations to Frontier, the future of *FiOS* in this state is at best uncertain as the future financial viability of Frontier itself is highly uncertain (see Chapter 8 below). Before allowing the death spiral to run its course, we believe it is essential that policy decisions be made as to the merit of retaining these legacy services and their underlying infrastructures as a baseline for those customers that do not perceive or that do not actually have alternatives. If these services are to be retained, the ILECs must be made to bring their level of service quality up to the full GO 133-C/D standards, because it is painfully apparent that the competitive market cannot be counted upon to produce this outcome.

Data collection and reporting pursuant to General Order 133-C and subsequent 133-D

General Order ("GO") 133-C was adopted by Decision (D.) 09-07-019 effective as of July 9, 2009, in Rulemaking (R.) 02-12-004, to become effective for purposes of service quality reporting as of January 1, 2010.[3] GO 133-C, in relevant part, requires that all "facilities-based URF [Uniform Regulatory Framework[4]] Carriers with 5,000 or more customers" report various service quality performance metrics on a monthly basis to be submitted quarterly to the Commission. Both Pacific Bell (d/b/a AT&T California, hereinafter "AT&T") and Frontier California

3. *Order Instituting Rulemaking into the Service Quality Standards for All Telecommunications Carriers and Revisions to General Order 133-B*, R. 02-12-004, D. 09-07-019 issued and effective as of July 9, 2009.

4. Order Instituting Rulemaking on the Commission's Own Motion to Assess and Revise the Regulation of Telecommunications Utilities, R.05-04-005, *Opinion*, D.06-08-030, August 24, 2006.

(formerly Verizon California, hereinafter "Frontier"), are "facilities-based URF Carriers with 5,000 or more customers" and are thus subject to this requirement. Under the provisions of GO-133-C §§ 3.3(c) and 3.4(c), both AT&T and Frontier (Verizon) have been obligated to provide reports as well as the underlying ("raw") trouble ticket data on all customer Trouble Reports and Out-of-Service records occurring on and after January 1, 2010.[5] In August 2016, the CPUC, by D.16-08-021 in R.11-12-001, adopted GO 133-D as a revision to the prior version of the same General Order.[6]

GO 133-D §3.3. Customer Trouble Reports – Applies to ... facilities-based URF Carriers with 5,000 or more customers ... Trouble reports apply to residential and small business customers (those that purchase five or fewer lines).

a. Description. Service affecting, and out of service trouble reports, from customers and users of telephone service relating to dissatisfaction with telephone company services. Reports received will be counted and related to the total working lines within the reporting unit in terms of reports per 100 lines.

b. Measurement. Customer trouble reports received by the utility will be counted monthly and related to the total working lines within a reporting unit.

c. Minimum Standard Reporting Level. Report number of trouble reports per 100 working lines (excluding terminal equipment reports). ... Six trouble reports per 100 working lines for reporting units with 3,000 or more working lines, eight reports per 100 working lines for reporting units with 1,001-2,999 working lines, and 10 reports per 100 working lines for reporting units with 1,000 or fewer working lines.

d. Reporting Unit. Exchange or wire center, whichever is smaller. A wire center with fewer than 100 lines should be combined with other central offices within the same location. A remote switching unit with fewer than 100 lines should also be added to its host switch. URF CLECs that do not have exchanges or wire centers shall report at the smallest reporting unit. All reporting carriers shall submit the raw data included in the report.

e. Reporting Frequency. Compiled monthly, reported quarterly.

GO 133-D §3.4. Out of Service Repair Intervals – Applies to ... facilities-based URF Carriers with 5,000 or more customers ....

a. Description. A measure of the average interval, in hours and minutes from the time of the reporting carrier's receipt of the out of service trouble report to the time service is restored for residential and small business customers.

5. G.O. 133-C, §§ 2, 3.

6. *Order Instituting Rulemaking to Evaluate Telecommunications Corporations Service Quality Performance and Consider Modification to Service Quality Rules*, R. 11-12-001, *Decision Adopting General Order 133-D*, D.16-08-021 August 18, 2016.

b. Measurement. Commitment is measured by taking the total number of the repair tickets restored within less than 24 hours divided by the total outage report tickets. In addition, the system average outage duration is measured by summing each repair interval, expressed in clock hours and minutes, between the time the customer called to report loss of service and when the customer regains dial tone, divided by the total outage report tickets. These measurements include only residential and small business customer tickets.

   Carriers shall submit both the adjusted and unadjusted out of service data.

   The adjusted measurements exclude Sundays, federal holidays and repair tickets when maintenance is delayed due to circumstances beyond the carrier's control. Typical reasons for delay include, but are not limited to: outage caused by cable theft, third-party cable cut, lack of premise access when a problem is isolated to that location, absence of customer support to test facilities, or customer's requested appointment. Deferred maintenance or lack of available spares are not circumstances beyond a carrier's control. Changed appointments shall be reported separately by identifying the number of such appointments and the time, in hours and minutes, associated with these appointments.

   A catastrophic event, an event where there is a declaration of a state of emergency by a federal or state authority, and a widespread service outage (an outage affecting at least 3% of the carrier's customers in the state) are circumstances beyond the carrier's control. A catastrophic event ends when the trouble ticket level returns to the average level three months prior to the catastrophic event. The average level is calculated by summing the actual number of out-of-service tickets for residential and small business (5 lines or less) customers for the three consecutive calendar months that did not have catastrophic events prior to the declared State of Emergency divided by three.

   When quarterly reporting includes a delay for one or more months or if a catastrophic event or widespread outages affects a carrier's adjusted reporting, the carrier shall provide supporting information as to why the month should be excluded and work papers which explain the event, the date(s), the areas affected, the total number of residential and small business lines affected, and how the adjusted figure was calculated.

c. Minimum Standard Reporting Level. 90% of all out of service trouble reports within 24 hours is the set minimum standard. Both the percentage of outages meeting the 24-hour standard and the actual system-wide average outage duration should be reported.

d. Reporting Unit. Reporting is at the state-wide level. However, carriers shall submit with the report the underlying data at the exchange or wire center level, whichever is smaller, that supports the information being reported. A wire center with fewer than 100 lines should be combined with other central offices within the same location. A remote switching unit with fewer than 100 lines should also be added to its host switch. URF CLECs that do not have exchanges or wire centers shall report at the smallest reporting unit. All reporting carriers shall submit the raw data included in the report.

e. Reporting Frequency. Compiled monthly and reported quarterly for those reporting units.

As it pertains to the subject matter of this Network Examination, GO 133-D §3.4(b), Measurement, was revised to include an expanded enumeration of causes resulting in Out-of-Service conditions that are beyond management's control. A new §9 has been added setting forth fines to be imposed upon carriers under certain protracted or excessive Out-of-Service conditions other than those caused by factors beyond management's control. GO-133-D became effective as of August 18, 2016, except for §9 (fines), which became effective as of January 1, 2017. Since at

least 6 years and 7 months out of the total of the 10 years under examination here were subject to GO-133-C, the analysis provided here is based upon the reporting requirements of that earlier version of the General Order. The nearly 7.3-million individual Trouble Report data records submitted by AT&T and by post-acquisition Frontier over the period have provided a solid basis for ETI's comprehensive assessment of the condition of the ILECs' California networks and their performance in maintaining service quality and in responding to service problems.

ETI's analysis of the condition of AT&T and Frontier's networks in California is, among other things, based upon the approximately 7.3-million Customer Trouble Report records submitted by the two companies over the 2010-2019 Study Period.

Trouble Reports, in general

A Trouble Report (sometimes referred to as a Trouble Ticket) is generally created when a customer contacts the telephone company to report a service problem. Service problems arise from any number of conditions, many of which fall outside of the responsibility of the ILEC or can be easily resolved by means of a help desk or technical support function. For example, a customer might be encountering difficulty using a custom calling feature such as three-way calling, voice mail, or caller id (where the calling number is displayed on a device owned by the customer and connected to the ILEC network). Although a Trouble Ticket may be created in such situations, many may be resolved quickly by providing assistance to the customer as to how the feature operates and how to use it.

GO 133-C/D established minimum standards and reporting levels for service on the network side of the demarcation. Not all network problems reported by a customer constitute out-of-service conditions. For example, the customer may report noise on the line, but is still able to originate and receive calls. For those that do involve an out-of-service condition, the Trouble Report record includes an "out-of-service indicator" as well as the date/time when the outage is reported and the date/time when it is ultimately cleared. From these date/time stamps, we are able to create a range of metrics regarding the duration of the out-of-service condition. In Phase 1 of this study, we examined all AT&T California and all Verizon/Frontier California Trouble Report records over the 2010-2017 study period. For Phase 2, we have undertaken a similar examination of these records for the Phase 2 2018-2019 period. However, as noted above, for Frontier, we have limited the Phase 2 analysis to the post-acquisition period, from April 2016 through December 2019. Table 4.1 below summarizes the quantities of trouble report records of various types that were included in our Phase 1 and Phase 2 analyses:

Table 4.1

QUANTITIES OF TROUBLE REPORTS AND ACTUAL OUT-OF-SERVICE CONDITIONS AT&T – JANUARY 2010 THROUGH DECEMBER 2019 FRONTIER – APRIL 2016 THROUGH DECEMBER 2019

	AT&T			Frontier		
Condition	**2010-2017**	**2018-2019**	**2010-2019**	**2016-2017**	**2018-2019**	**2016-2019**
Trouble Reports – all types	6,219,742	741,581	6,961,323	160,590	145,561	306,151
Out-of-Service–all types	5,001,270	573,581	5,574,851	118,402	112,030	230,432
Out-of-Service–less than one (1) hour	328,357	26,544	354,901	978	507	1,485
Out-of-Service–more than one (1) hour	4,672,913	547,037	5,219,950	117,424	111,523	228,947
Out-of-Service–morethan6hours	3,814,579	437,937	4,252,516	101,110	98,152	199,262
Out-of-Service–morethan12hours	3,541,959	410,553	3,952,512	92,927	91,130	184,057
Out-of-Service–morethan24hours	2,480,593	320,567	2,801,160	63,737	64,811	128,548
Out-of-Service–morethan1week	272,465	62,412	334,877	7,330	12,694	20,024

NOTES: (1) AT&T did not provide records of non-OOS Trouble Reports in 2010
(2) Some post-acquisition Frontier data may not include non-OOS Trouble Reports

Table 4.1 provides counts for all types of Trouble Reports and Out-of-Service conditions. However, GO-133-C/D allows for certain adjustments and exclusions where the OOS condition, or some portion of it, is considered to be beyond management's control.

One such situation arises where the outage commences, ends, or includes a Sunday or a legal holiday. For example, if an outage is reported at 10:00 am on a Friday and is cleared at 3:00 pm the following Monday, the total duration of the outage (77 hours) is adjusted to exclude the 24 Sunday hours, putting the "official" outage duration for this example at 53 hours (i.e., 77–24). From the customer's perspective, however, the duration was 77 hours, not 53. ETI has analyzed and organized the OOS metrics using both the "actual" and "CPUC" or "adjusted" durations. Table 4.2 provides OOS counts based upon the adjusted "CPUC" durations. Notably, and as detailed in Chapters 4A and 4F below, even after removing these "excluded" Sunday/Holiday hours, both ILECs still fell far short of meeting the GO 133-C/D requirement that 90% of outages be cleared within 24 hours. Quarterly summaries are provided in Tables 4A.9 (for AT&T) and 4F.7 (for Frontier). Wire center-level details are provided in Tables 4A.2 to 4A.6 (for AT&T) and 4F.2 to 4F.6 (for Frontier).

Table 4.2

QUANTITIES OF TROUBLE REPORTS AND OUT-OF-SERVICE CONDITIONS ADJUSTED TO EXCLUDE SUNDAYS AND HOLIDAYS PER GO 133-C/D AT&T – JANUARY 2010 THROUGH DECEMBER 2019 FRONTIER – APRIL 2016 THROUGH DECEMBER 2019

	AT&T			Frontier		
Condition	**2010-2017**	**2018-2019**	**2010-2019**	**2016-2017**	**2018-2019**	**2016-2019**
Trouble Reports – all types	6,219,742	741,581	6,961,323	124,185	181,966	306,151
Out-of-Service–all types	5,001,270	573,581	5,574,851	91,626	138,806	230,432
Excluded due to cause beyond management's control	830,780	157,676	988,456	3,247	24,979	28,226
Out-of-service conditions within management's control	4,170,490	415,905	4,586,395	88,379	113,827	202,206
Out-of-Service–less than one (1) hour	31,805	334,437	366,242	706	852	1,558
Out-of-Service–more than one (1) hour	3,852,439	386,546	4,238,985	90,920	111,532	202,452
Out-of-Service–more than six (6) hours	3,101,288	304,883	3,406,171	78,349	94,440	172,789
Out-of-Service–more than twelve (12) hours	2,873,377	210,920	3,084,297	71,936	83,587	155,523
Out-of-Service–more than twenty-four (24) hours	1,954,453	101,966	2,056,419	49,155	47,521	96,676
Out-of-Service–more than one (1) week	194,104	-23,529	170,575	3,480	6,578	10,058

NOTES: (1) AT&T did not provide records of non-OOS Trouble Reports in 2010
(2) Some post-acquisition Frontier data may not include non-OOS Trouble Reports

In addition to the Sunday/Holiday adjustments, certain out-of-service conditions "when maintenance is delayed due to circumstances beyond the carrier's control," such as "outage caused by cable theft, third-party cable cut, lack of premise access when a problem is isolated to that location, absence of customer support to test facilities, or customer's requested appointment" have also been treated as "excluded" even though, from the customer's perspective, the service is nevertheless not functioning.[7] ETI does not believe that it is appropriate to entirely exclude all instances where the customer has requested an appointment date/time at the customer's convenience. Instead, the delay in the ultimate restoration of service attributable to the additional time needed to satisfy the customer's request for an appointment should be adjusted out of the total out-of-service duration; ETI has been advised that such an adjustment is already reflected in the "CPUC Duration" calculation provided on the raw Trouble Report data.

Each Trouble Report record also includes a "Cause Code." Notably, 16.8% of the roughly 5-million AT&T out-of-service conditions over the Phase 1 study period had been attributed to "Heavy Rain," "Weather," "Moisture," or "Wet Plant." Over the Phase 2 2018-2019 period, that number almost doubled, to 29.6%. The Phase 1 data indicated that more than 40% of all out-of-

7. GO 133-C/D, at §3.4.

service conditions had been attributed to problems with "ILEC Plant or Equipment," although there is no detail as to exactly what type(s) of ILEC Plant and Equipment are at fault. The corresponding figure for 2018-2019 is only 7.62%, suggesting a possible refinement in the fault reporting process.

16.8% of the roughly 5-million AT&T out-of-service conditions over the Phase 1 study period had been attributed to "Heavy Rain," "Weather," "Moisture," or "Wet Plant." Over the Phase 2 2018-2019 period, that number almost doubled, to 29.6%.

The AT&T Cause Codes that arise most frequently are summarized in Table 4.3. In determining whether an individual record should be "excluded," ETI has relied upon the "Excluded" flag rather than the Cause Code.

Table 4.3

MOST COMMON AT&T CAUSE CODES AND THE NUMBER OF OCCURRENCES 2010-2019

Cause code and description		Occurrences 2010-2017	2018-2019	2010-2019
300	ILEC Plant or Equipment	2,089,225	43,679	2,132,904
600	Unknown – Trouble condition cannot be determined	1,367,019	114,419	1,481,438
421	Heavy rain	474,887	54,070	528,957
310	Overload – excessive demand	303,759	3,362	307,121
304	Plant Conditioning	95,253	97,013	192,266
400	Weather	128,518	52,266	180,784
319	Wet plant not storm-related	124,815	31,878	156,693
420	Moisture	112,706	31,345	144,051
322	Out of Adjustment	109,881	29,185	139,066
100	Caused or overlooked by AT&T Employee	113,706	14,766	128,472
541	Out of Adjustment	95,929	14,696	110,625
204	Customer request to move or remove equipment	77,694	18,525	96,219
120	Outage caused by ILEC employee during outside plant construction	65,759	18,409	84,168
550	Damage to plant caused by animals or insects	56,697	8,879	65,576
302	AT&T Plant or Equipment Missing/Removed	29,006	94,109	123,115

NOTE: AT&T did not provide records of non-OOS Trouble Reports in 2010

It appears that all of these most common Cause Codes refer to failure in outside plant and/or circuit equipment, not to central office switches. In Chapter 3 of our Phase 1 Report, we noted that both carriers' central office switch inventories are quite ancient, some in the 20-30 year old range. Despite their age and reliance upon generations-old computer technology, these ancient switches do not appear to be the source of many, if any, recorded service outages.

Following the exclusions of trouble conditions deemed beyond the utility's control, the AT&T 2010-2019 dataset consisted of 4,586,395 remaining out-of-service records and 202,206 for post-acquisition (2016-2019) Frontier.

The source of most service outages continues to be largely confined to weather-driven and other failures in outside plant, rather than to the ILECs' aging central office switches or associated equipment.

The "raw" Trouble Report data

As noted, GO 133-C/D requires the URF ILECs to provide the underlying ("raw") Trouble Report data for every service-related contact initiated by a customer. This "raw data" is used by the ILEC to prepare the quarterly Trouble and Out-of-Service reports that are required by GO 133-C/D. Over the period January 2010 through and including December 31, 2019, AT&T provided the Commission with approximately 6.96-million individual Trouble Report records, roughly 5.57-million of which were associated with Out-of Service ("OOS") conditions of varying lengths. In the 45-month period since the transfer of Verizon California to Frontier on April 1, 2016, Frontier California provided the Commission with 306,151 out-of-service records covering the period April 2016 through December 2019.

The continuing collapse of the California ILEC market environment

Both AT&T and Frontier provide basic local telephone service across extensive geographic footprints throughout California. AT&T operates 615 wire centers, and provides service in 51 of the State's 58 counties. Frontier operates some 270 wire centers, and provides service in 26 counties. Both companies have experienced a massive erosion of the legacy circuit-switched local "Plain Old Telephone Service" ("POTS") customer base over the ten year period covered by this Study. This erosion has been driven by a number of factors, including actions of the two companies and their affiliates themselves.

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Substitution of wireless for wireline services continues. FCC data indicate that, for California, total wireline voice service access lines in service (ILEC and non-ILEC, circuit-switched and VoIP) decreased by 6.23-million, down 32.72%, from 19.65-million as of the beginning of 2010 to 13.42-million as of the end of 2018, while the number of wireless subscriptions increased by 10.4-million, from 32.94-million connections in 2010 to 43.34-million in 2018. Overall, there were 3.9 million more wireless connections than the 39.4 million California population, which was as of the end of 2018.

Figures 4.1 through 4.6 illustrate these demand shifts and erosions for California statewide over the period 2008-2018, based upon published FCC data,[8] which covers all California service providers. AT&T and Verizon/Frontier combined constitute the overwhelming share of ILEC-provided switched access service in California. Figure 4.1 shows the change in total ILEC circuit-switched (POTS) voice lines together with the growth of interconnected VoIP subscriptions (ILEC and non-ILEC) over the period. Although the 72.61% drop in ILEC POTS lines between 2010 and 2018 has been slightly offset by the increase in ILEC-provided VoIP services, overall ILEC circuit-switched plus VoIP lines decreased by 62.43% over the 2008-2018 time frame. Figures 4.2 and 4.3 show ILEC legacy service losses to non-ILEC competitor-provided services, separately for residential and business customers, respectively. Residential ILEC POTS lines decreased by 81.66%; whereas business POTS lines dropped by only 60.93%. Figure 4.4 plots California ILEC and CLEC switched access line losses over the 2008-2018 period. While both types of carriers have seen an erosion of demand for circuit-switched services, ILEC losses have been far greater.[9] Figure 4.5 compares the growth in VoIP services for California ILECs (1.57-million lines) and CLECs (4.14-million lines).. As the graph demonstrates, the vast majority (more than 75%) of the growth in VoIP services has come from the non-ILEC sector.

Figure 4.6 illustrates how the demand for voice services has shifted away from wireline to wireless. Wireless lines in California increased by 10.40-million, up 31.57%, from 32.94-million connections in 2010 to 43.34-million in 2018. The State's total population at the end of 2018 was 39.4-million – i.e., 3.94-million more wireless phones than people (including infants and newborns). Over the same time period, total *wireline* voice service demand saw a 6.23-million decrease, down 32.72%, from 19.65-million in 2010 to 13.42-million in 2018.

8. FCC Industry Analysis Division Office of Economics and Analytics, *Voice Telephone Services: Status as of December 31, 2018*, re. March 2020, Supplemental Table 1. Voice Subscriptions (in Thousands) - California, available at https://www.fcc.gov/voice-telephone-services-report (accessed 6/9/21).

9. The average number of working lines reportable under GO 133-C/D (which includes all ILEC and CLEC voice access lines) decreased from 11.48-million in 2010 to 6.15-million in 2017. CPUC staff compilation of carrier-reported data.

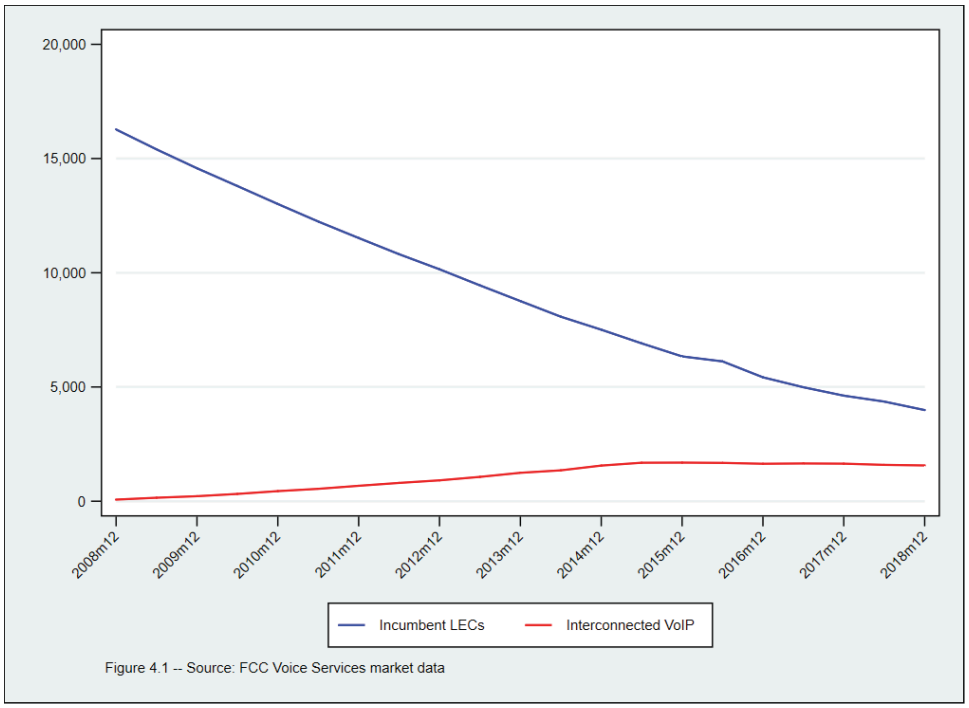

Figure 4.1. California ILECs saw a precipitous drop in demand for circuit-switched legacy voice access lines over the 2010-2019 period, only a portion of which were replaced by ILEC-provided VoIP services.

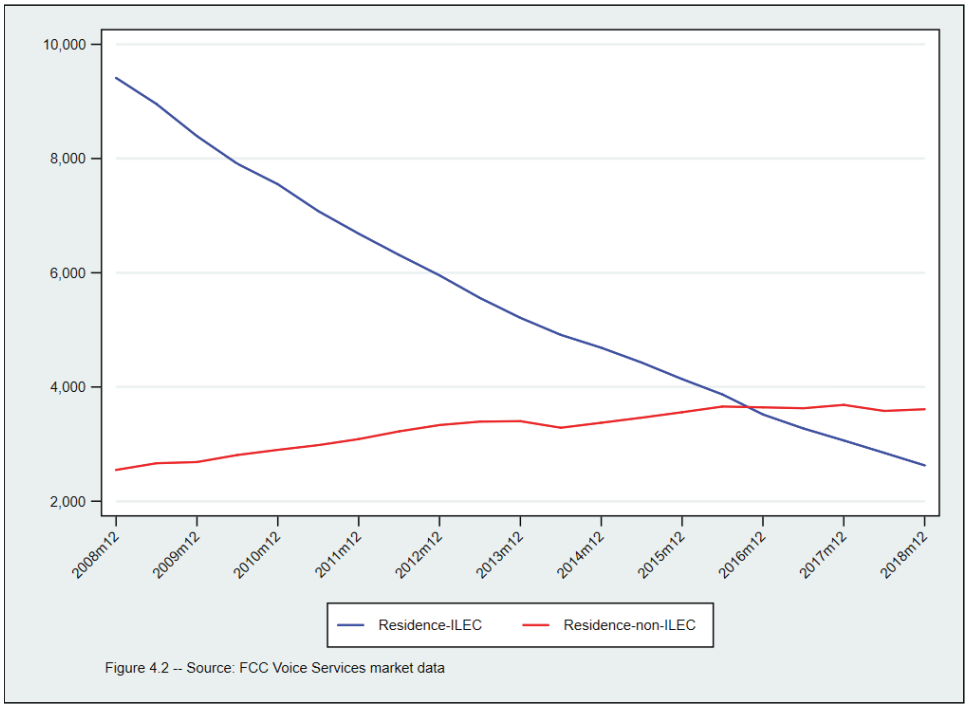

Figure 4.2. A substantial share of California ILEC residential line losses was the result of customer migrations to cable MSOs and other ILEC competitors.

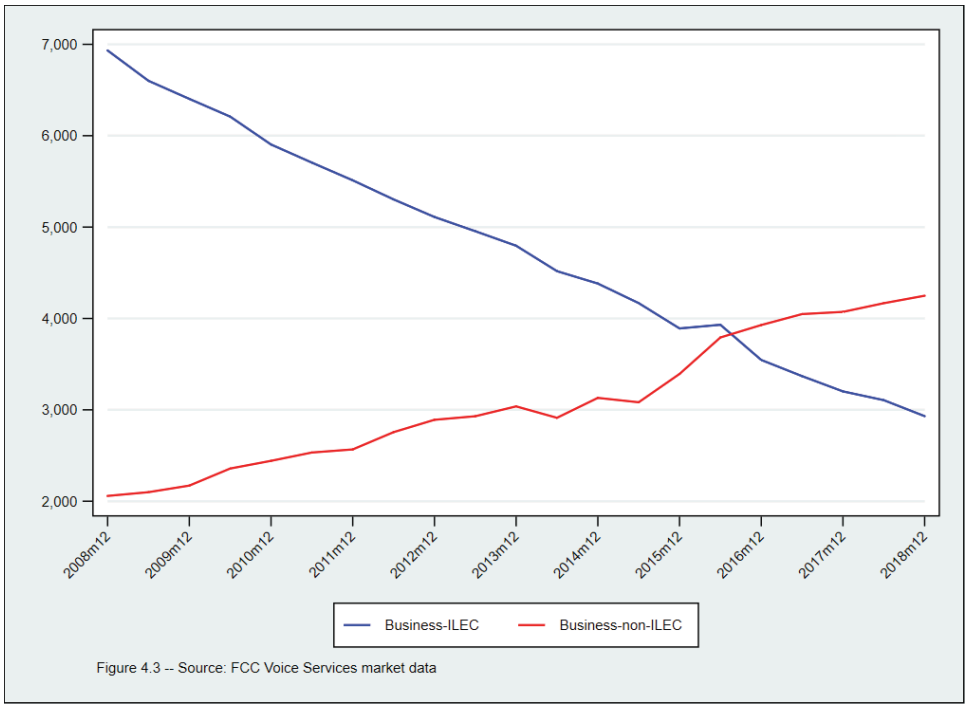

Figure 4.3. ILEC business customers also migrated to competing service providers that offer SIP trunking, virtual PBX, and other VoIP services.

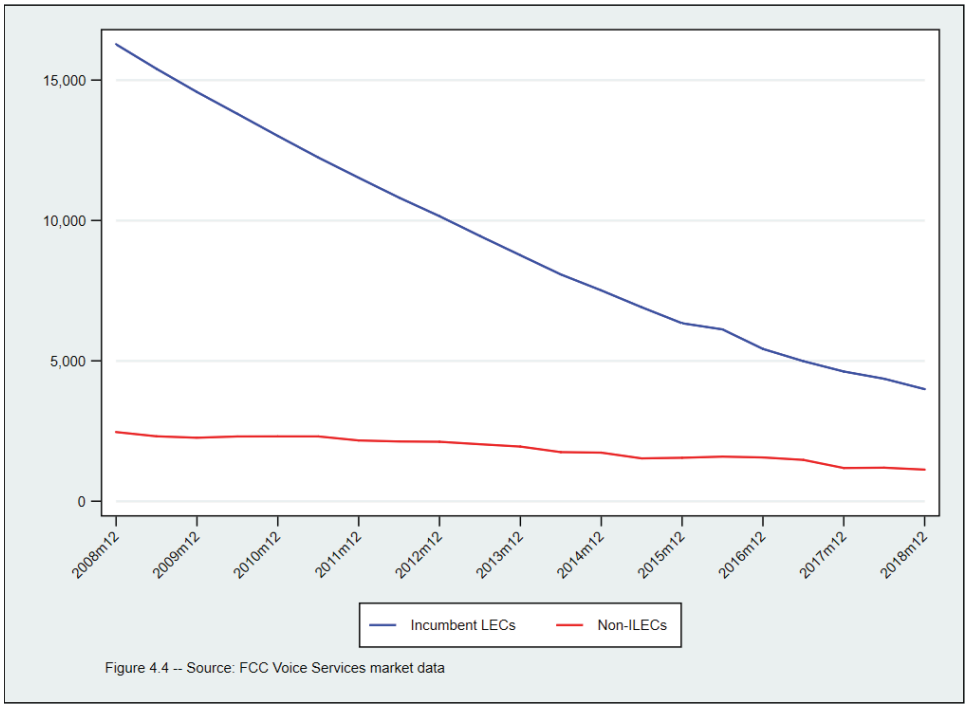

Figure 4.4. ILECs and CLECs have experienced switched access line losses over the 2008-2018 period, but ILEC losses have been far greater.

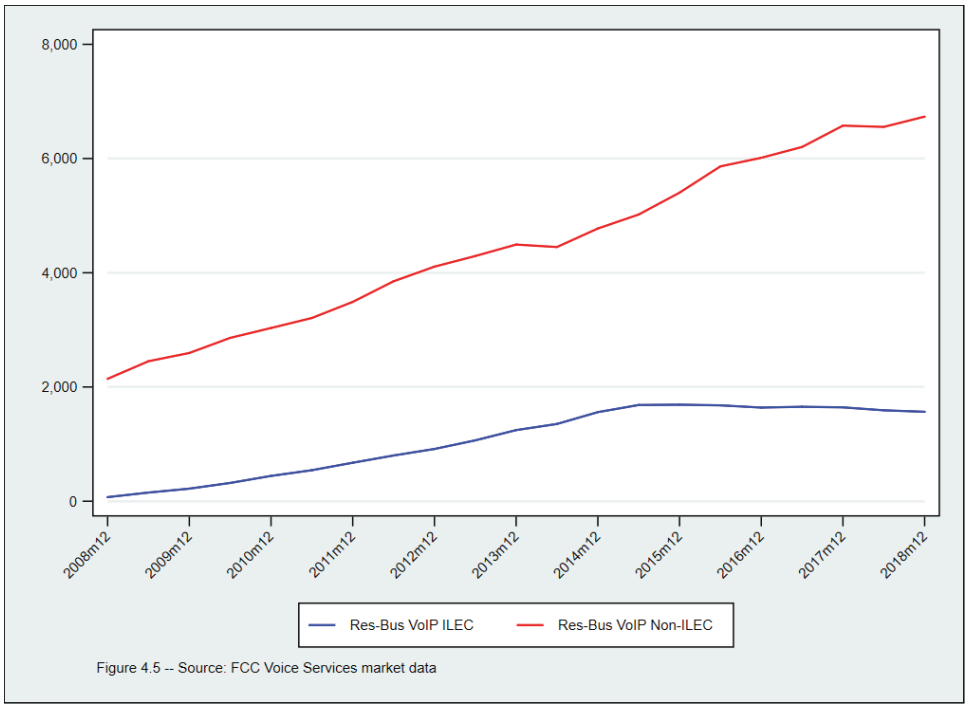

Figure 4.5. The vast majority of the growth in VoIP services from 2008 to 2018 has been in the non-ILEC sector.

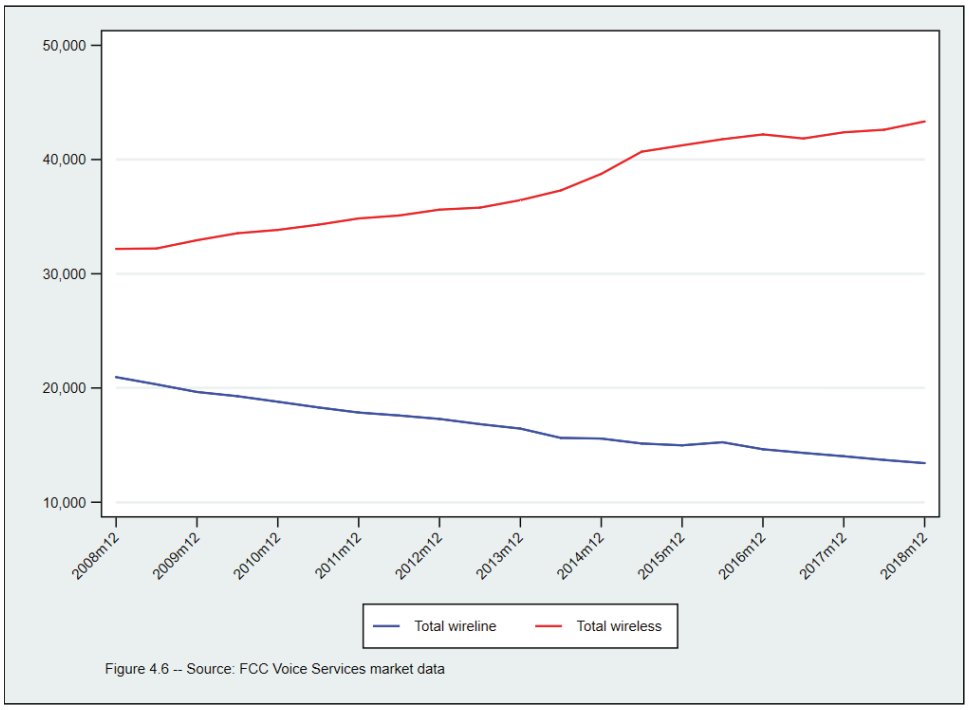

Figure 4.6. Perhaps the largest source of the shift in demand away from ILEC and other wireline voice services in California has been the mushrooming growth in demand for wireless.

Identifying long-term trends from actual month-to-month experience

As noted, there is considerable month-to-month variation across all of AT&T's 615 California wire centers, and for AT&T California overall, in the number of trouble reports received and out-of-service situations reported. As an example, Figure 4.7 below is a reproduction of Figure 4A.4 which appears in Chapter 4A below. It plots the average duration of AT&T service outages on a quarterly basis from the first quarter of 2010 through the fourth quarter of 2019. As is evident, there is considerable variation in this metric from one period to the next. For this reason, inspection of individual quarterly data over an extended period of time is not a useful means for identifying the long-term trend in this or other service quality metrics.

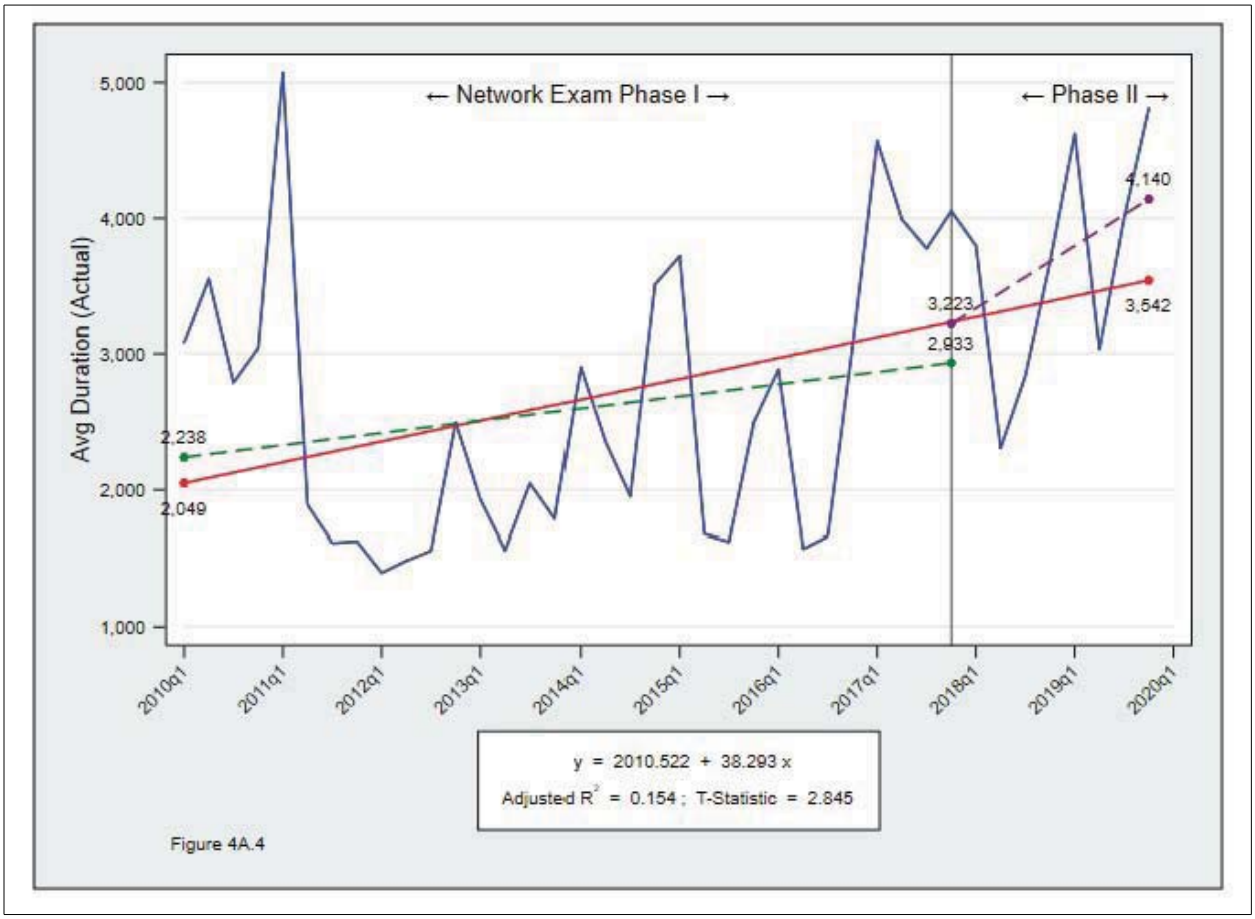

Figure 4.7. Sample chart (Average duration of AT&T California service outages, 2010-2019) providing individual trend lines calculated for 2010-2017 (Phase 1), 2018-2019 (Phase 2) and for the full 2010-2019 period.

In this example, the period with the highest average duration occurred in the first quarter of 2011, yet the long-term trend in duration is in the upward direction. A simple comparison of individual quarters in the series without considering any of the intervening values could lead to

an erroneous conclusion that the incidence of OOS had actually improved over the full study period. It is possible, however, to extract a long-term trend from data that exhibits considerable variation from period to period, as is the case here. This is accomplished by using statistical techniques known as linear regression analysis that can calculate a long-term trend by mathematically "fitting a line or curve" to the individual data points in the series, in effect, smoothing out the period-to-period variation so as to permit the observation of a long-term trend over the entire period. For the charts provided in this Phase 2 Report, we have calculated three separate trend lines: (1) the solid red line is calculated over the entire 10-year 2010-2019 combined Phase 1/Phase 2 study period; (2) the dashed green line is calculated over the original 2010-2017 Phase 1 study period, and is identical to the trend lines provided in our Phase 1 Report; and (3) the dashed purple line is calculated over the 2018-2019 Phase 2 study period.

In this example, there is a significant change in the slope of the trend line as between the Phase 1 and Phase 2 study periods. While the average duration of AT&T service outages had been trending upward over the 2010-2017 period, the *rate of increase* after 2017, as captured graphically in the steeper upward slope of the 2018-2019 trend line, has clearly been accelerating. The discontinuity between the Phase 1 and Phase 2 trend lines arises because each is calculated separately based upon data for the two separate (Phase 1 and Phase 2) periods.

We have adopted this graphic format in all of the updated charts in Chapters 4, 4A and 4F so as to provide a clear visual indication as to whether each of the studied service quality metrics is showing improvement or degradation over the past two years.