Avista Utilities
Electric Service Reliability
2020

AVISTA

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Avista's Electric System Service Reliability Report for 2020

Introduction

Background

Avista's Electric System Service Reliability Report documents the annual reliability performance of our electric system for the prior reporting year, which is filed each year with the Washington Utilities and Transportation Commission (WUTC or Commission).[1] This report contains results of the Company's electric service in 2020.

For this annual report our definition of "electric system" has always referred to our overall network[2] of transmission lines, substations, and the distribution lines, or "feeders," that carry electricity to every home and business in our Washington and Idaho service area. "Service reliability" refers to the "uptime"[3] our customers experience for the year. Interruptions in service to our customers (service outages) reduce the uptime they experience. Like all electric utilities, Avista tracks and reports-out on various measures regarding the number of times in the year our customers experience a service outage and the length of time of these outages (outage duration). In accordance with Commission rules,[4] the Company established a baseline year of 2005 for each of its reliability measures and then annually compares the results for each reporting year with the baseline statistics and results for the most-recent seven-year period. In addition to reporting reliability statistics, Avista must also report any changes to the methods used to collect and report the results, identify the geographic areas of greatest reliability concern on the Company's electric system, and explain our plans to improve reliability performance in those areas. The detailed reporting requirements are listed under definitions and electric system reliability reporting requirements, provided in Appendix A. Additionally, Avista reports on the complaints from its customers related to power quality and service reliability as shown in Appendix E. Avista files its annual electric service reliability report with the Commission by April 30th of each year.

[1] Pursuant to Washington Administrative Code (WAC) 480-100-398.

[2] Entire electric system, irrespective of state jurisdiction.

[3] Uptime is a measure of the time electric system is available and in service for customers during the year. A customer who experiences no service outages during the year would have a service uptime of 100%.

[4] WAC 480-100-393.

Providing Our Customers Reliable Electric Service

Avista is focused on maintaining a high degree of reliability as an important aspect of the quality of our service,[5] particularly as our society becomes ever more reliant upon electronic technologies. The Company's objective has been to *generally uphold our current level of reliability,* which we believe is acceptable to our customers. Providing a level of system reliability that is adequate for our customers represents a complex balance of customer expectations, cost, and performance. Because it is expensive to achieve every new increment of system reliability, and because these investments must be sustained over a period of many years to achieve objectives measured at the level of the overall system, it is important to ensure that we are prudently investing only the amount of money it takes to achieve an acceptable level of performance. Our customers' satisfaction with their service reliability is also heavily dependent on factors other than the actual reliability of our physical system. For example, perceptions of the priority Avista places on avoiding outages and quickly restoring service when outages occur, as well as the quality and timeliness of information we provide them during an outage, have much greater bearing on customer satisfaction than our actual reliability performance.[6] Avista believes the current reliability performance of our system, along with our customer care and communications, achieves an effective balance, and because of this, represents a cost-effective value for our customers. This assessment is evidenced by our high level of customer satisfaction with their overall service from Avista, including aspects of electric reliability, our customers' satisfaction with their power quality and reliability, by the low number of complaints we receive each year that are related to reliability issues, by our performance being in a reasonable range for the electric utility industry, and our results generally aligning with results for Avista in the Commission's Reliability Benchmarking Study.

Purpose of this Report

As noted above, this report describes results of the Company's annual monitoring of several key reliability indices, or statistics, metrics, or measures. Primary indices are industry standard measures developed by the Institute of Electrical and Electronic Engineers (IEEE), which are important in promoting standardized and comparable reporting across the utility industry. In addition to these IEEE indices, the Company also monitors and uses in its analyses several other reliability measures, all of which are briefly described below.

- **System Average Interruption Frequency Index:** Often referred to by its acronym **SAIFI**, is the average number of sustained[7] interruptions or outages per customer for the year. This index value, developed by the IEEE, is calculated by dividing the total number of outages on the system each year by the average total number of customers on the system for that year. Dividing the value by the total number of customers normalizes the number of outages for comparison with other utilities.
- **System Average Interruption Duration Index**: Often referred to by its acronym **SAIDI**, is the average duration (or length) of sustained interruptions per customer for the year. This index value, developed by the IEEE, is calculated by dividing the total number of customer outage hours

[5] Electric customers regularly report that service reliability is the most important aspect of the service they receive from their electric provider (example: JD Power reports that power quality and reliability accounts for 28% of the overall satisfaction electric customers report for their utility service).

[6] Assessing Residential Customer Satisfaction for Large Electric Utilities. L. Douglas Smith, et al., University of Missouri St. Louis, Department of Economics Working Paper #1007, May 2015.

[7] Any service interruption greater than five minutes in duration.

(number of customers experiencing an outage multiplied by the duration of the outage) experienced on the system for the year by the average total number of customers on the system for that year. Dividing the value by the total number of customers normalizes the number of outages for comparison with other utilities.

- **Customer Average Interruption Duration Index**: Often referred to by its acronym **CAIDI**, is the average duration of sustained interruptions for those customers who experienced a service outage that year. This index value, developed by the IEEE, is calculated by dividing the total number of customer outage hours experienced on the system for the year by the total number of customers who experienced an outage that year. Since this measure reflects the duration of outages for customers experiencing those outages, it is often used to represent the utility's average outage restoration time.

- **Average Outage Duration**: This measure is used by Avista to describe the average duration of outages on the system. Since this average number of hours per outage is not divided by any number of customers or any other value, it is not an index value.
- **Average Number of Customers per Outage Event:** This measure is used by Avista to describe the average number of customers that were impacted by all the outages on the system during the year. This value is calculated by totaling all customers impacted by outage events for the year and dividing by the number of outage events for the year. This measures the effectiveness of our efforts to minimize the impact of individual outage events on our customers.
- **Number of Outage Events**: This measure is the number of outage events on our system each year that result in a sustained outage for our customers. Since the number of outage events is not divided by any other number it is not an index value.
- **Total Customer Outage Hours**: This measure is the total number of customer outage hours that were experienced by the customers on our system for the year. For each event, the number of customers experiencing the sustained outage is multiplied by the duration of the outage to yield the customer outage hours for each event. Summing all individual events' customer outage hours over a year yields the total customer outage hours. Since this total number of customer hours is not divided by any other number it is not an index value.

In addition to these primary reliability metrics, Avista also tracks the following measures:

- **Momentary Average Interruption Frequency Index**: Often referred to by its acronym **MAIFI,** this index is the average number of momentary interruptions (outages) per customer for the year. It is calculated the same way as SAIFI but uses the number of momentary outages instead of the number of sustained outages. By definition, a momentary outage has a duration of less than five minutes.
- **Customer Experiencing Multiple Interruptions**: Often referred to by its acronym **CEMI**, this metric is the number of customers who experience greater than an identified or set number of interruptions for the year.

The standard reliability statistics and their calculation are discussed in greater detail in Appendix B.

The Company is also required to report on any changes it has made in the prior year in the collection of reliability data or in calculating values for each reliability index. A brief record of such changes the Company has made historically is provided in Appendix C. As part of this reporting, Avista must also compare its annual reliability performance to a set of baseline reliability statistics, which were established in 2005.[8] All of the data included in this report, as noted above, is based on system data representing Avista's entire electric service territory in Washington and Idaho.

[8] WAC 480-100-393(3)(b).

Results for Avista's Electric System Reliability in 2020

System Results

Results for several of the above-referenced reliability measures for 2020 are provided in Table 1 below. In addition to the current year results we have also listed the prior year result, the five-year average for each measure, and the 2005 baseline value.

Reliability Measure	2020 Results	2019 Results	Prior 5-Year Average (2015-2019)	2005 Baseline
System Average Interruption Frequency Index (SAIFI)	0.87	0.94	0.97	0.97
System Average Interruption Duration Index (SAIDI)	129 minutes (2.15 hours)	136 minutes (2.27 hours)	148 minutes (2.47 hours)	108 minutes (1.80 hours)
Customer Average Interruption Duration Index (CAIDI)	149 minutes (2.49 hours)	145 minutes (2.42 hours)	153 minutes (2.55 hours)	112 minutes (1.87 hours)

Table 1: Reliability Results for Key Measures in 2020[9]

Major Event Days

Avista tracks and reports reliability issues associated with major events,[10] and lists in Table 2 the Major Event Days (MEDs) affecting its system in 2020. A historic record of MEDs on our system is provided in Appendix G.

Major Event Days (2020)	SAIDI (hours)	Event Cause
2020 Major Event Day Threshold (T_{MED})	8.90	
January 12	13.80	Weather-Snow/Ice
January 13	9.57	Weather-Snow/Ice
February 1	12.57	Weather-Snow/Ice
February 23	9.14	Weather-Snow/Ice
March 14	9.25	Weather-Wind
September 7	94.09	Weather-Wind
September 8	15.75	Weather-Wind
October 23	35.97	Weather-Snow/Ice
October 24	15.53	Weather-Snow/Ice
November 13	21.27	Weather-Snow/Ice
December 6	10.10	Animal-Bird

Table 2: Major Event[11] and Major Event Days[12] Experienced in 2020

[9] Excludes outage results for qualifying major event days.

[10] Major Events and Major Event Days as used in this report are defined by the IEEE *Guide for Electric Power Distribution Reliability Indices*, IEEE P1366-2012. Avista's definition and use of the terms 'major event' and 'major event days' are taken from this IEEE Standard. The Company will use the process defined in IEEE P1366 to calculate the threshold value of T_{MED} and to determine MEDs. All indices will be reported both including and excluding MEDs. The comparisons of service reliability to the baseline statistics in subsequent years will be made using the indices calculated without MEDs.

[11] Major Event – Designates an event that exceeds reasonable design and or operation limits of the electric power system. A Major Event includes at least one Major Event Day.

[12] Major Event Day – A day in which the daily system SAIDI exceeds a threshold value, T_{MED}. For the purposes of calculating daily system SAIDI, any interruption that spans multiple calendar days is accrued to the day on which the interruption began. Statistically,

System Average Interruption Frequency Index

Figure 1 below shows the SAIFI on the Company's system for the seven-year period of 2014-2020, including the linear trend.[13] As shown, the decreasing trend shows significant progress in the reduction of outage events despite the significant upward deviation experienced in 2017. As noted in prior reports, the number of outages for 2017 was in the highest quartile of results measured on the Company's system since 2005. By contrast, the number of outages on our system in 2018 was the lowest number recorded since we began reporting results in 2005. As noted in Table 1, the SAIFI value of customer outages in 2020 is 0.87, a 7.7% decrease from the prior year. These swings in performance results demonstrate that random factors outside the direct control of the Company continue to be the predominant drivers of our annual service reliability.

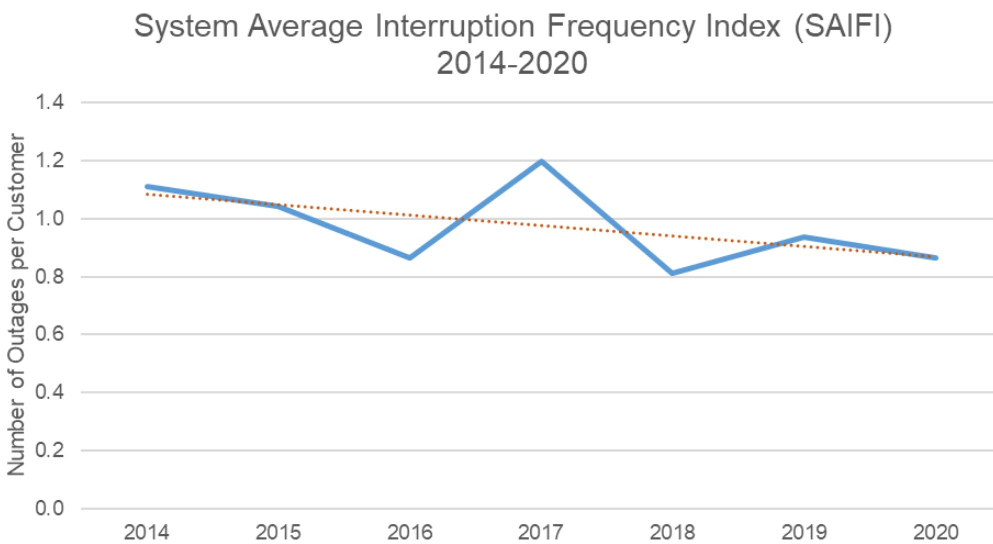

Figure 1: System Average Interruption Frequency Index (SAIFI) 2014-2020

A historical summary of SAIFI data since 2004 is included in Appendix F.

System Average Interruption Duration Index

Figure 2 below shows the SAIDI on the Company's electric system for the seven-year period of 2014-2020, including the linear trend.[14] The average duration of outages for all customers in 2020 was slightly lower than the prior years' results. As noted in Table 1, the SAIDI value of customer outages in 2020 is 2.15 hours, a 5.2% decrease from the prior year. The relatively low values reported over the most recent three years has shifted the linear trend to slightly improving the SAIDI results for Avista's customers.

days having a daily system SAIDI greater than T_{MED} are days on which the energy delivery system experienced stresses beyond that normally expected, such as severe weather. Activities that occur on major event days should be separately analyzed and reported.

[13] Excluding outages associated with Major Event Days.

[14] Excluding Major Event Days.

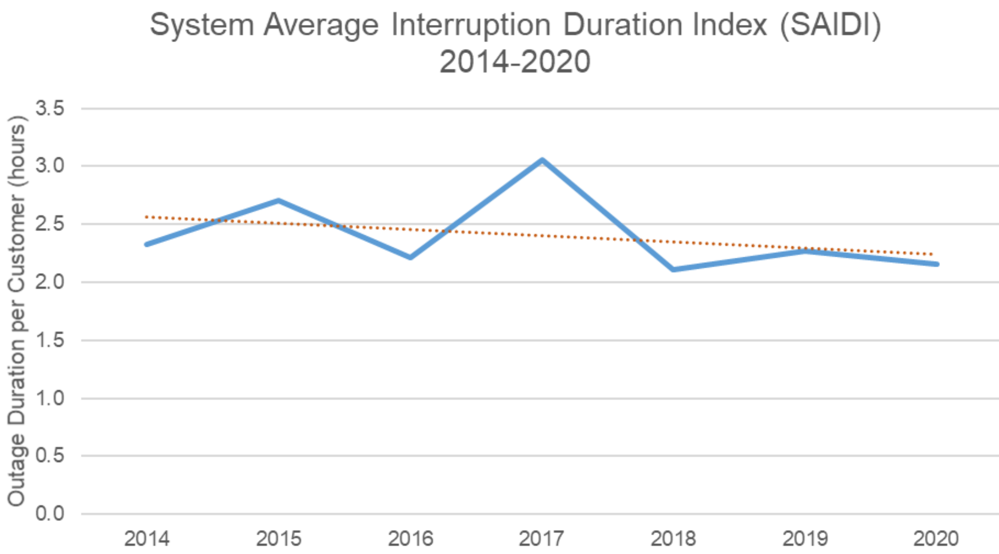

Figure 2: System Average Interruption Duration Index (SAIDI) 2014-2020

A historical summary of SAIDI data since 2004 is included in Appendix F.

Customer Average Interruption Duration Index

Figure 3 below shows the CAIDI on the Company's system for the seven-year period of 2014-2020, including the linear trend.[15] Relatively similar results reported since 2015, coupled with historically-lower results dropping out of this seven-year reporting period, have served to dampen what had been in prior years a robust increase in the linear trend. While the current trend still reflects a slight deterioration in the performance of this metric, the increase of 19% over this seven-year period is substantially reduced from the increase of 29% reported in the seven-year period through 2018. As noted in Table 1, the CAIDI value of customer interruption durations in 2020 is 2.49 hours, a 2.6% increase from the prior year.

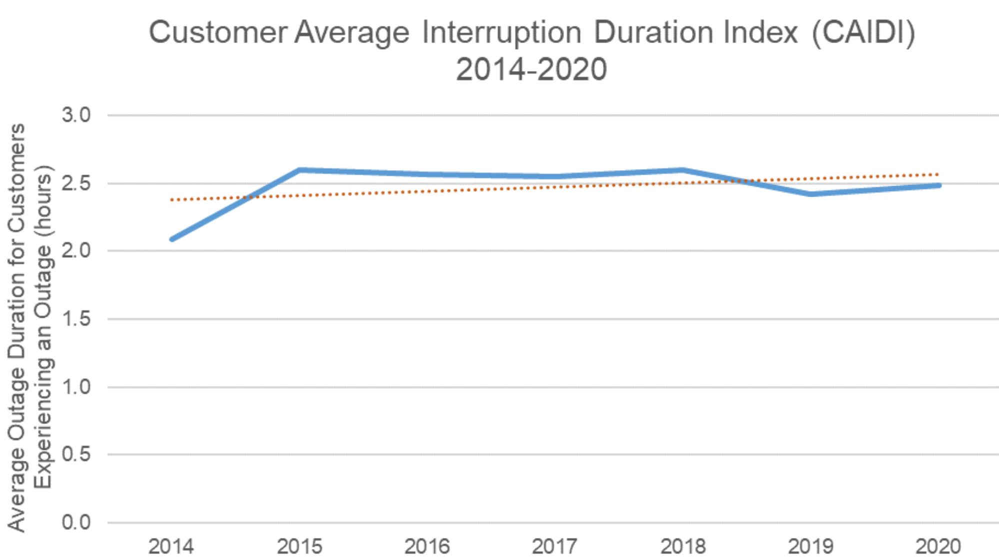

Figure 3: Customer Average Interruption Duration Index (CAIDI) 2014-2020

[15] Excluding Major Event Days.

Average Outage Duration

Figure 4 below shows the average outage duration on Avista's system for the seven-year period of 2014-2020, including the linear trend.[16] The trend continues to reflect a modest decrease in the average duration of outage events on Avista's system, even with slight increases relative to the trend from 2019 and 2020 results. While this trend may appear to conflict with the trend for CAIDI shown above in Figure 3, this measure considers only the average of outage duration times and does not include the total number of customers or number of customers associated with the outages, and therefore is not an index value.[17]

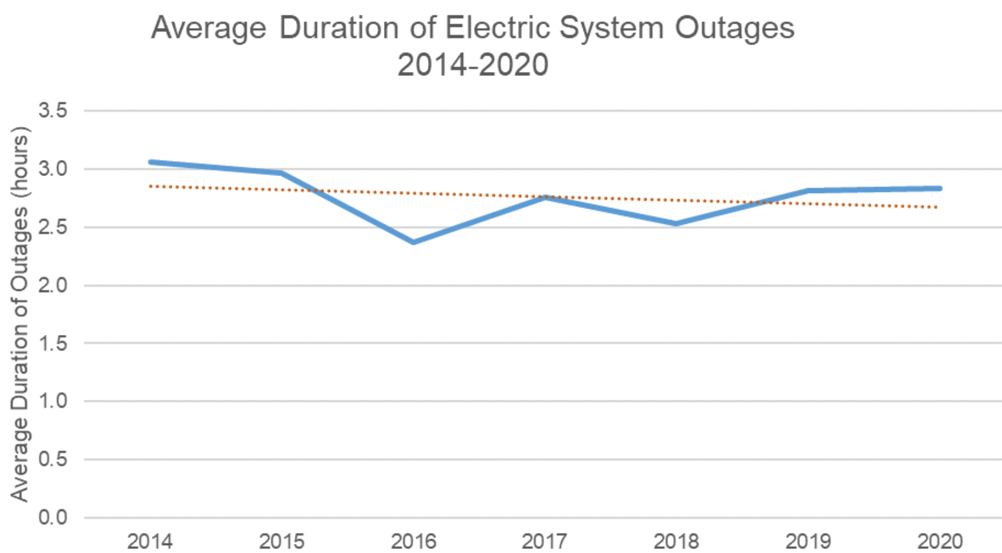

Figure 4: Average Outage Duration 2014-2020

Average Number of Affected Customers per Outage Event

Figure 5 below shows the average number of affected customers per outage event on Avista's electric system for the seven-year period of 2014-2020, including the linear trend.[18] The trend shows a significant decrease in the average number of customers affected per outage event on Avista's system, even with the increases noted in the results for 2019 and 2020. This continued reduction is the result of the Company's efforts to improve fuse coordination on feeders and laterals, install midline reclosers on feeders of all types, and implement feeder automation and communications with Fault Detection Isolation and Restoration (FDIR) and other Distribution Management System (DMS) capabilities.

[16] Excluding Major Event Days.

[17] Avista understands this trend in reduced outage duration is likely the result of the increasing number of outage events associated with maintenance and upgrades on the Company's system. These planned outages typically involve a small number of customers and short in duration, such that they serve to reduce the overall average duration for outages of all causes.

[18] Excluding Major Event Days.

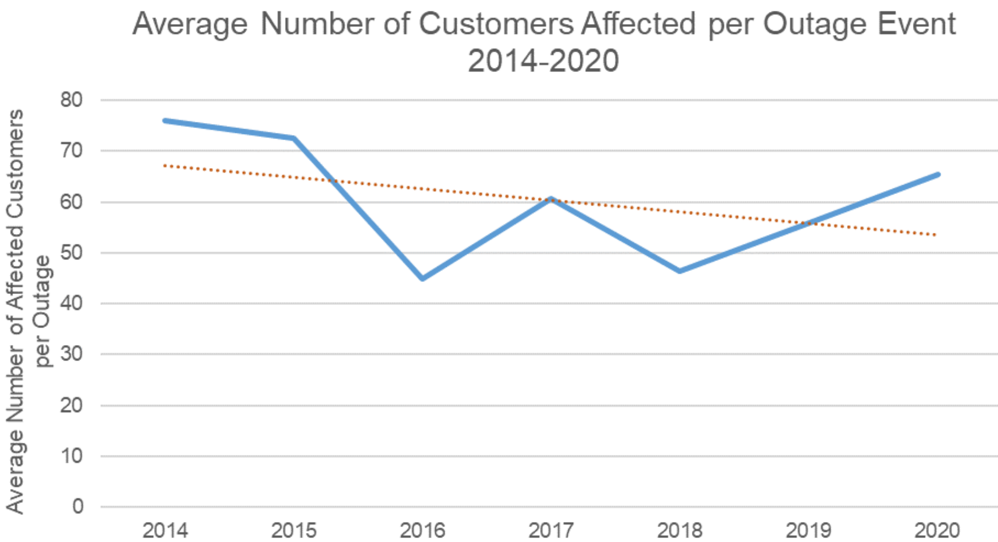

Figure 5: Average Number of Customers Affected per Outage Event 2014-2020

Number of Outage Events

Figure 6 below shows the number of outage events on Avista's system for the seven-year period of 2014-2020, including the linear trend.[19] The results for 2020 continue this metric's improvement relative to the trend established over the reporting period. The linear trend for this period continues to be influenced by the results of 2016 and 2017. As in recent prior years, one of the leading factors driving an increase in the number of outage events is the amount of planned maintenance and construction work being performed on Avista's system.

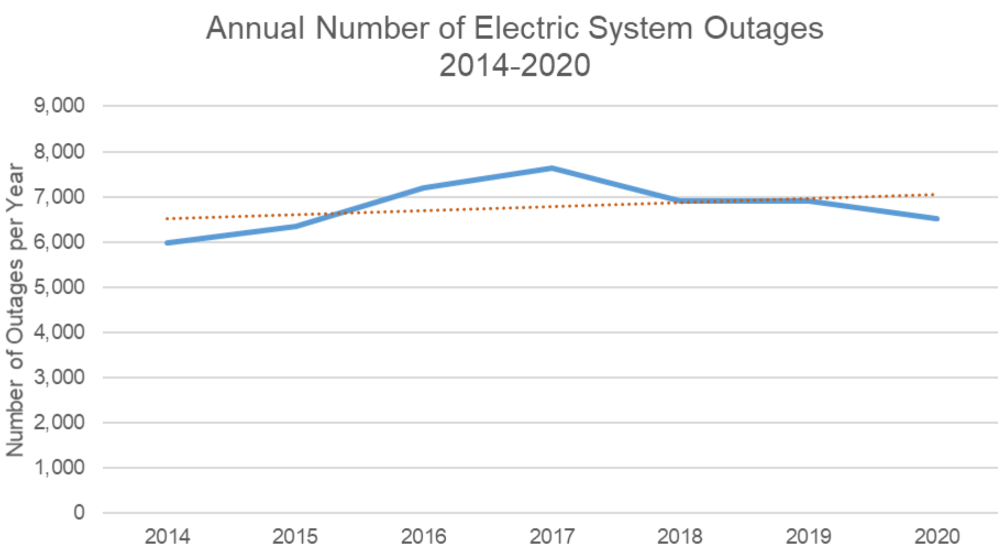

Figure 6: Annual Number of Outage Events 2014-2020

[19] Excluding Major Event Days.

Customer Outage Hours

Figure 7 below shows the number of customer outage hours on Avista's system for the seven-year period of 2014-2020, including the linear trend.[20] With consistent results for 2018, 2019, and now 2020, the overall trend for this seven-year reporting period is showing a slight decrease relative to prior reports. The formulas for calculation of the number of outages (SAIDI) and outage restoration time (CAIDI) share the same numerator, which is the number of customer outage hours. The number of outages and the duration of these outages impact the customer outage hours metric. Both these factors are discussed briefly in the sections below.

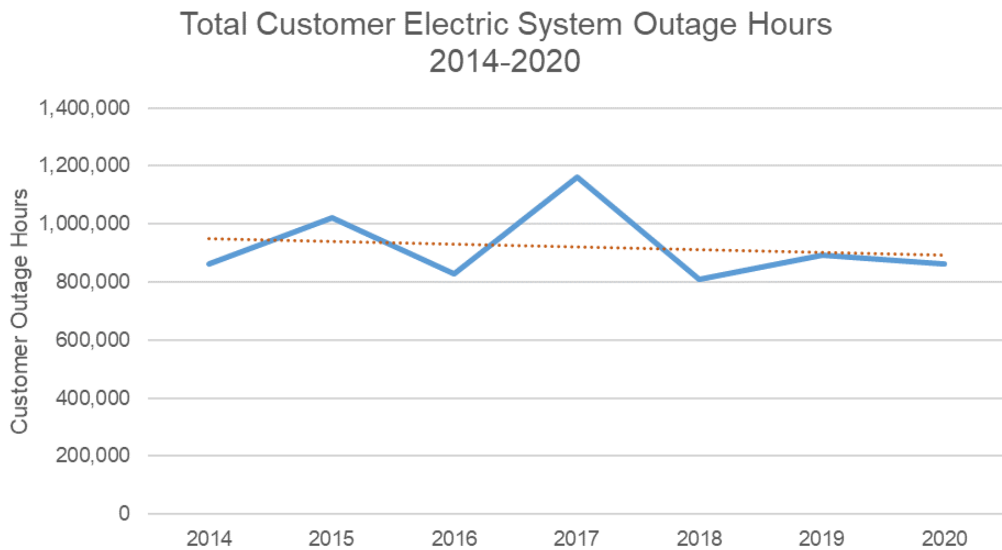

Figure 7: Total Customer Outage Hours 2014-2020

[20] Excluding Major Event Days.

Analysis of System Reliability Measures by Feeder Classification

Classification of Feeders by Customer Density

Following the evaluation of the system reliability measures presented previously, summary statistics for the electric system segmented into urban, suburban, and rural feeders is shown in Table 3 below.[21]

Feeder Classification	Customer Distribution	Energy Consumption	Contribution to Customer Outage Hours	Contribution to Number of Outage Events
Urban	11.6%	8.6%	3.7%	7.1%
Suburban	54.4%	46.7%	23.2%	35.0%
Rural	34.0%	44.8%	73.1%	57.9%

Table 3: Summary Comparison of Feeder Data, Outage Hours, and Outage Events [22]

This summary data provides insight as to the unique characteristics and diversity of Avista's service territory. While customers on suburban feeders represent more than half the service population, this group experiences just 35% of the outage events. Conversely, customers on rural feeders represent just of one-third of the customer base but experience almost 60% of the outages. These summary characteristics also highlight:

- Consumption of electricity per customer is highest on rural feeders, outpacing per customer consumption on suburban feeders by over 50% and urban feeders by almost 80%.
- Customer outage hours on rural feeders account for more than 70% of the system total, experienced by only 34% of the customer base.
- Customers on a suburban feeder experience outages at a five times greater frequency than urban customers. Customers on a rural feeder experience eight times as many outages as urban customers.

SAIFI by Feeder Type

The system-level trend for this reliability measure, as shown above in Figure 1, reflects an improvement in reliability performance over the seven-year reporting period. Figure 8 below shows significant improving trends for both rural and suburban feeders, with stable performance represented by the urban feeders.

[21] Avista's feeder classification is based on customer density per feeder mile: Urban is more than 150 customers per mile, Suburban is between 50 and 150 customers per mile, and Rural is less than 50 customers per mile.

[22] Results for this table are based on number of customers and electricity consumption in 2020, and their contribution to customer outage hours and number of outage events for the 2014-2020 period.

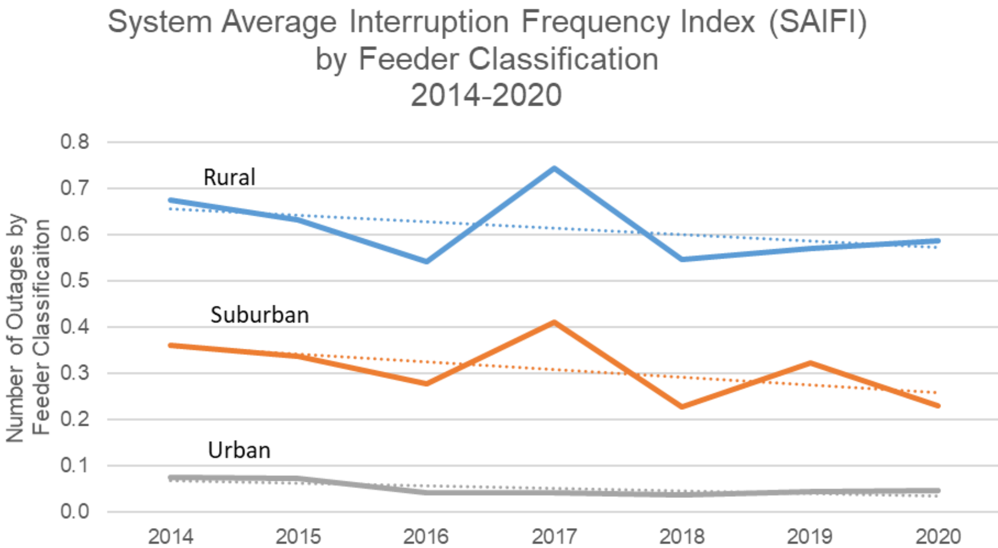

Figure 8: SAIFI by Feeder Classification 2014-2020

SAIDI by Feeder Type

The system-level trend for this reliability measure, as shown above in Figure 2, reflects continuing improvement in reliability performance over this seven-year reporting period. The continued reduction in outage duration for rural feeders since 2017 is largely responsible for this changing system-level trend. Results by feeder classification shown in Figure 9 below indicates a relatively flat trend for outage duration for rural feeders, continuing a substantial shift from an increasing trend reported in prior years. The trend is slightly improving for suburban feeders and is generally stable for urban feeders.

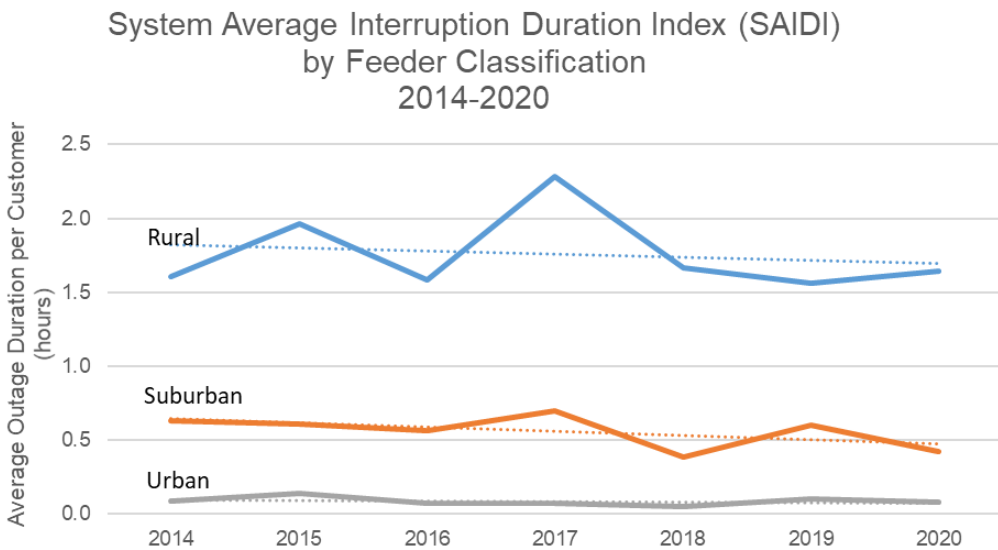

Figure 9: SAIDI by Feeder Classification 2014-2020

CAIDI by Feeder Type

The system-level trend for this reliability measure, as shown above in Figure 3, reflects a slight increase in outage restoration time for Avista's customers who experience an outage, even with the stable to lower results reported over the prior three years. Reported by feeder classification in Figure 10 below, this index shows slightly increasing trends for urban, suburban, and rural feeders. The trend for rural feeders is less pronounced in the current seven-year average where the trend increase is approximately 3%; in contrast, the percentage increase reported in prior years was nearly 40%. These results show a continuing pattern where the contribution of outage events on rural feeders is largely driving the overall system performance toward a modest deterioration in reliability for this index.

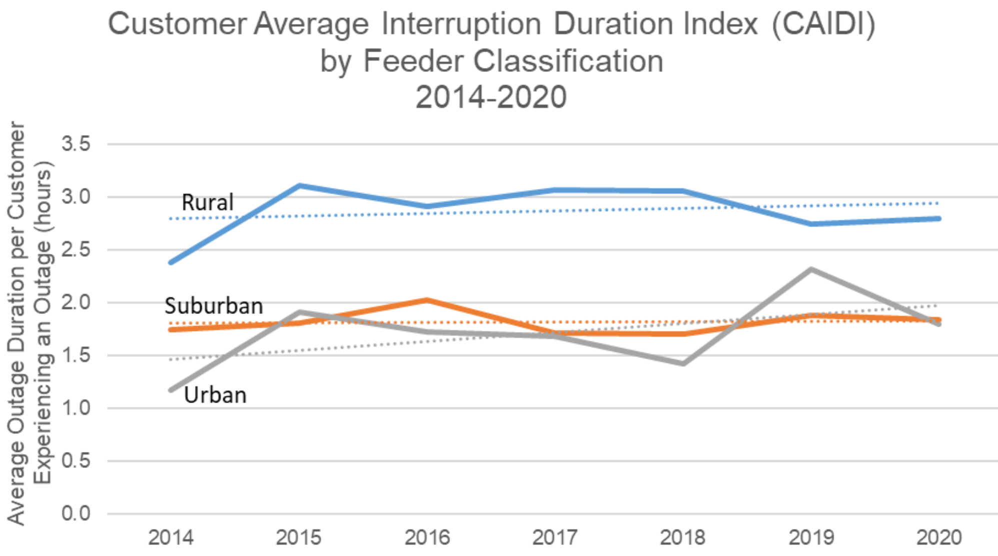

Figure 10: CAIDI by Feeder Classification 2014-2020

Average Outage Duration Time by Feeder Type

While the system average annual outage duration is trending downward overall, as shown above in Figure 4, the results by feeder classification shown below in Figure 11 demonstrate that the system trend is being driven mostly by suburban and rural feeders. While the emphasis on improving rural feeders has been evident, the downward trend for customers served on suburban feeders is a reversal in trend from prior reporting periods. Outage duration on urban feeders continues to trend upward.

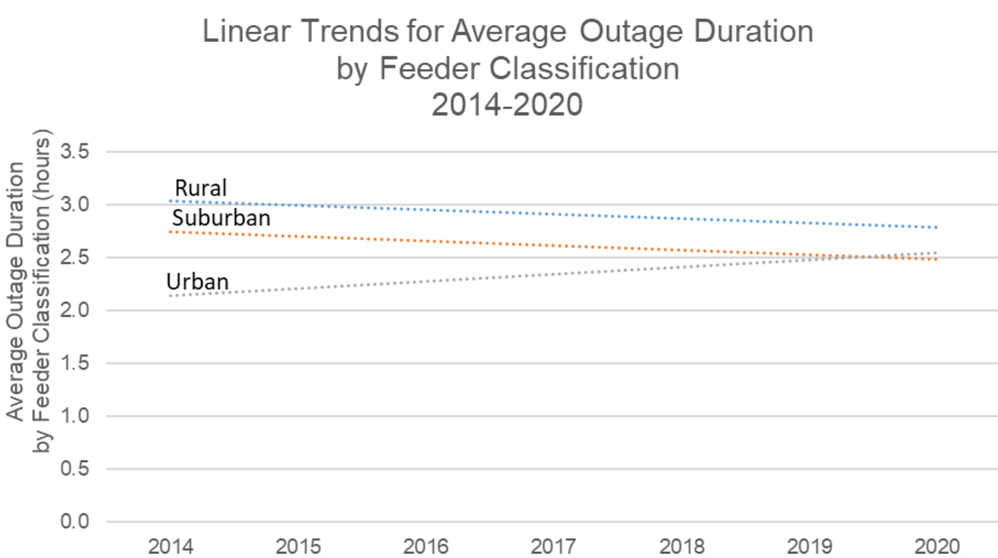

Figure 11: Linear Trend for Average Outage Duration by Feeder Classification 2014-2020

Average Number of Affected Customers per Outage Event by Feeder Type

The system average number of affected customers continues trending downward overall, as shown above in Figure 5, and Figure 12 below shows a relatively consistent result for outages on urban, suburban and rural feeders comprising the Company's system. These results, as discussed above, reflect incremental progress from the Company's efforts to reduce the impact of sustained outage events on customers across its system.

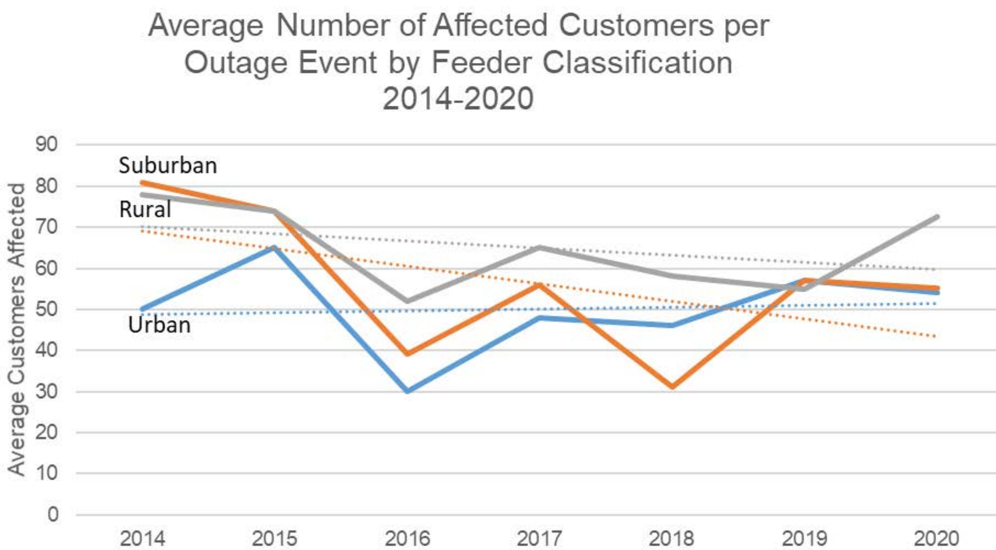

Figure 12: Average Number of Affected Customers per Outage Event by Feeder Classification 2014-2020

Number of Outage Events by Feeder Type

In Figure 6 above, for number of outage events on the Company's electric system, the results showed a sustained increase in the linear trend over the seven-year period. Breaking down these events by feeder classification, shown in Figure 13 below, shows the disparity in annual outages among feeder types. The number of outage events on suburban and urban feeders is essentially flat over the period, while the upward trend on rural feeders influences the system-level results. The results also show the much greater contribution of outage events associated with our rural feeders, which accounted for just less than half of all sustained outages in 2020.

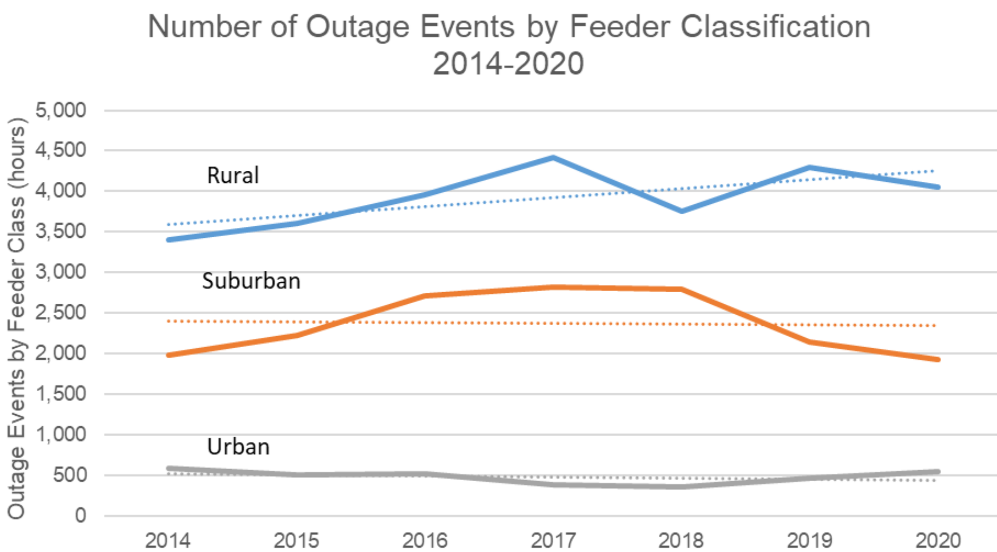

Figure 13: Number of Outage Events by Feeder Classification 2014-2020

Customer Outage Hours by Feeder Type

Figure 7 above shows the total number of customer outage hours on the Company's electric system trending slightly lower over the current seven-year period. Based on the data shown in Figure 14 below, the contribution of outage hours by feeder classification demonstrates that the decrease is due to the trend from rural and suburban feeders while urban feeders continue a flat trend. As discussed above, the influence of outage hours for rural feeders accounted for over 73% of total outage hours in the current seven-year period. While prior reports showed a growing difference between the combined urban and suburban feeders to the rural feeders over time, the difference in the trends has moderated though the magnitude of comparative outage hours remains significant.

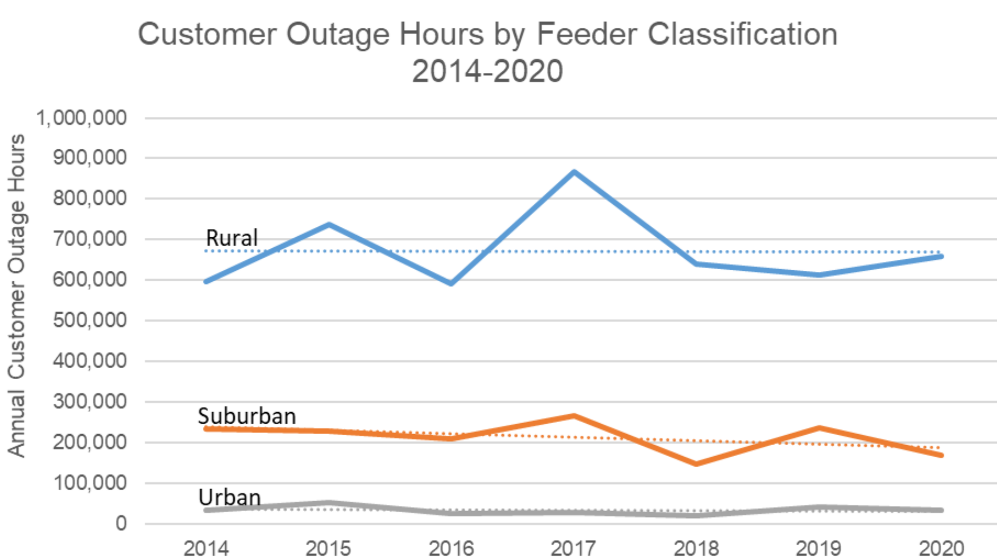

Figure 14: Customer Outage Hours by Feeder Classification 2014-2020

Overall Service Reliability by Feeder Type

Service Reliability on Urban Feeders

The Company's urban feeders serve approximately 12% of Avista's electric customers and generally provide very-high levels of service reliability, having slightly less than 4% of the total customer outage hours and 7% of total outage events. As shown in Table 4 below, of the seven key measures for urban feeders included in this report, four are at a comparative *Very Low* range for Avista's reliability results and three are in a *Moderate* range. The trending results over the seven-year reporting period are considered stable, except for the measures addressing outage durations, which are increasing.

Reliability Measure	Range	Trend
System Average Interruption Frequency Index (SAIFI)	Very Low	Stable
System Average Interruption Duration Index (SAIDI)	Very Low	Stable
Customer Average Interruption Duration Index (CAIDI)	Moderate	Increasing
Average Duration of Outages	Moderate	Increasing
Average Number of Affected Customers per Outage	Moderate	Stable
Number of Outage Events per Year	Very Low	Stable
Total Customer Outage Hours	Very Low	Stable

Table 4: Key Reliability Trends for Urban Feeders, 2014-2020

Service Reliability on Suburban Feeders

The Company's suburban feeders serve approximately 54% of Avista's electric customers and, like the urban feeders discussed above, have historically provided very high levels of service reliability. Customers served by suburban feeders experience 35% of total outage events but account for only about 23% of the total customer outage hours. Of the seven key measures for suburban feeders shown in Table 5 below, all are in the range of *Low* to *Moderate* relative to Avista's comparative range of reliability performance. Six of these measures are trending stable or decreasing over the seven-year reporting period, while the CAIDI values are exhibiting an increasing trend. The trend for average number of affected customers per outage has stabilized from the prior reporting period, benefiting from the continued deployment and operation of FDIR infrastructure across suburban feeders during the period represented in this report.

Reliability Measure	Range	Trend
System Average Interruption Frequency Index (SAIFI)	Moderate	Decreasing
System Average Interruption Duration Index (SAIDI)	Low	Decreasing
Customer Average Interruption Duration Index (CAIDI)	Moderate	Increasing
Average Duration of Outages	Moderate	Decreasing
Average Number of Affected Customers per Outage	Moderate	Decreasing
Number of Outage Events per Year	Moderate	Stable
Total Customer Outage Hours	Low	Decreasing

Table 5: Key Reliability Trends for Suburban Feeders, 2014-2020

Service Reliability on Rural Feeders

Avista's rural feeders serve 34% of Avista's electric customers, however these customers experience 58% of the total outage events and 73% of the total customer outage hours. Reliability performance on these rural feeders, while reasonable for the remote locations served and difficult conditions encountered, has historically been in the *High* end of the range of Avista's comparative range of reliability results as shown in Table 6. One of the measures, average number of affected customers, is typically in the same range as that measurement for urban and suburban feeders. From a trending perspective, five of the seven measures are decreasing or stable, with the performance of CAIDI and the number of outage events per year increasing. These results remain consistent with those reported previously. As noted above, the magnitude of difference in outage events and customer outage hours between the rural feeders and the combined urban and suburban feeders asserts significant influence on Avista's system-level results for these measures.

While the average duration of outages is decreasing on Avista's rural feeders, the CAIDI trend is increasing due to the significant number of outage events experienced on these feeders. The trend for the total customer outage hours metric has stabilized, though the increase in the number of outage events is outpacing the decreasing trend of the average number of customers impacted per outage event.

Reliability Measure	Range	Trend
System Average Interruption Frequency Index (SAIFI)	High	Decreasing
System Average Interruption Duration Index (SAIDI)	High	Decreasing
Customer Average Interruption Duration Index (CAIDI)	High	Increasing
Average Duration of Outages	High	Decreasing
Average Number of Affected Customers per Outage	Moderate	Decreasing
Number of Outage Events per Year	High	Increasing
Total Customer Outage Hours	High	Stable

Table 6: Key Reliability Trends for Avista's Rural Feeders, 2014-2020

Service Reliability of Avista's Rural Feeders

Customer Outage Hours for Rural Feeders

In the previous reporting period, the Company's rural feeders added an average of just over 40,000 customer outage hours each year to the system total, or approximately 140,000 additional hours for the seven-year period. For the current study, 2014-2020, this negative trend has slowed to a more gradual increase of just over 4,500 hours on an annual basis, or about 32,000 hours for the full seven-year period. Table 7 below shows the average rates of change for the top 12 causes and the net change contribution to the slight increase of annual average customer outage hours.

Outage Cause Category	2013-2019 (hours)	2014-2020 (hours)	Change (hours/year)
Tree Intrusion	595,745	643,711	6,852
Undetermined	387,943	420,197	4,608
Public	410,304	433,464	3,309
Weather	1,254,627	1,270,787	2,309
Pole Fire	339,307	353,713	2,058
Miscellaneous	5,855	5,238	(88)
Company Operations	24,323	23,394	(133)
Underground Equipment	68,005	63,148	(694)
Animal Intrusion	171,615	164,457	(1,023)
Overhead Equipment	591,039	576,847	(2,027)
Substation Equipment	93,948	67,846	(3,729)
Planned Operations	732,643	684,412	(6,890)
Total	4,675,354	4,707,214	4,551

Table 7: Average Annual Change in Customer Outage Hours by Cause for Rural Feeders, 2014-2020

Consistent with previous comments, this assessment points to increasing outage impacts and customer outage hours from factors external to Avista's control, including tree interference and public events such as car-hit pole. Avista's own work to improve the condition of these feeders continues to focus on minimizing requisite interruptions to the customer. Investments made in the system are having the effect of slightly reducing the customer outage hours associated with both underground and overhead equipment as well as substation equipment failures. Customer outage hours associated with weather-caused outage events increased slightly during this current reporting period. The ongoing maintenance and upgrade work being performed by the Company on its rural feeders should continue to positively influence this data in subsequent periods.

The top twelve reasons contributing to customer outage hours on Avista's rural feeders are shown in Figure 15 below.

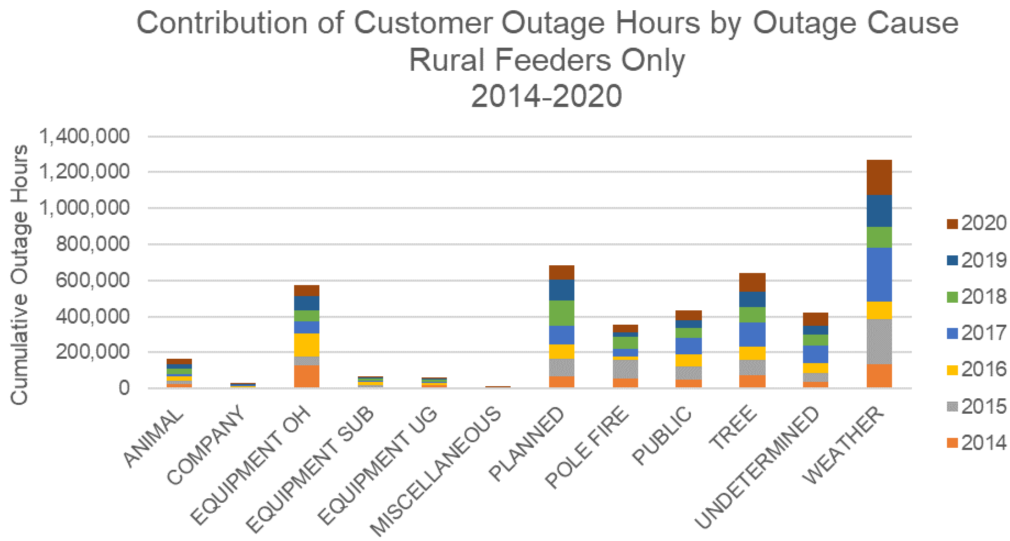

Figure 15: Contribution to Customer Outage Hours by Outage Cause on Rural Feeders, 2014-2020

As is typical on Avista's system, weather related outages continue to be the leading contributor to customer outage hours on rural feeders, contributing more than 1.2 million hours over the seven-year period. The second leading cause is Avista's planned maintenance and upgrade activities that contributed over 680,000 outage hours, a decrease of approximately 50,000 hours from the prior year's report. The remaining causes of outages, in order of contribution, include tree intrusion, overhead equipment failure, public events such as car-hit pole, undetermined events, pole fires, animal intrusions, substation equipment, underground equipment, Company activities, and finally, miscellaneous outages.

Feeders with Greatest Service Reliability Challenges

For the purposes of this limited discussion, the top ten feeders defined on Avista's system that have faced the greatest reliability challenges in the current reporting period, based on five of the reliability measures discussed above for the same seven-year reporting period, are listed in Table 8. In addition, a five-year trend in outage events on these feeders is included. The individual feeders are listed by the code abbreviations Avista uses as a naming convention for feeders in its system, with the first three characters in each label signifying the originating substation for the feeder.

System Average Interruption Frequency Index (SAIFI)	System Average Interruption Duration Index (SAIDI)	Customer Average Interruption Duration (CAIDI)	Total Customer Outage Hours	Annual Number of Outage Events	Five-year Trend in Outage Events
CLV34F1	CLV34F1	GRV1273	CLV34F1	CLV34F1	CLV34F1
STM633	GRV1273	WEI1289	GRV1273	STM633	STM633
GIF34F1	GIF34F1	GIF34F2	GIF34F1	GIF34F1	GIF34F2
GRV1273	STM633	WAL543	STM633	GIF34F2	GIF34F1
STM631	GIF34F2	KET12F2	GIF34F2	ORI12F3	STM631
SPI12F1	ORI12F3	GIF34F1	ORI12F3	STM631	ORI12F3
BLU321	STM631	COB12F1	STM631	CHW12F3	CHW12F3
ORI12F3	SPI12F1	SPI12F2	SPI12F1	VAL12F1	RAT233
GIF34F2	WEI1289	OGA611	WEI1289	RAT233	VAL12F1
M15514	BLU321	VAL12F3	BLU321	MLN12F1	ARD12F2

Table 8: Top Ten Most Challenging Feeders by Reliability Measure

When considering the implications of feeders on these lists of reliability measures, the frequency of inclusion provides significant awareness for opportunities to improve the performance of those feeders. For instance, GIF34F1 and GIF34F2 both appear in each of the six categories listed. Similarly, there are four feeders that are included in five of the categories, namely CLV34F1, STM633, STM631, and ORI12F3. Since the increase in outage events on rural feeders has been a key contributor to customer outage hours, that reliability measure is also included. Evaluating feeders by this measure resulted in the addition of two feeders to the results compared with the four prior measures. Sorting the rural feeders by the five-year trend in outage events introduces one additional feeder, ARD12F2, that did not appear elsewhere on the summary list.

Considering the measure for customer outage hours, the cumulative outage hours for the 2014-2020 report timeframe are calculated for the top ten most challenging feeders by outage reason or cause and shown in Figure 16 below.

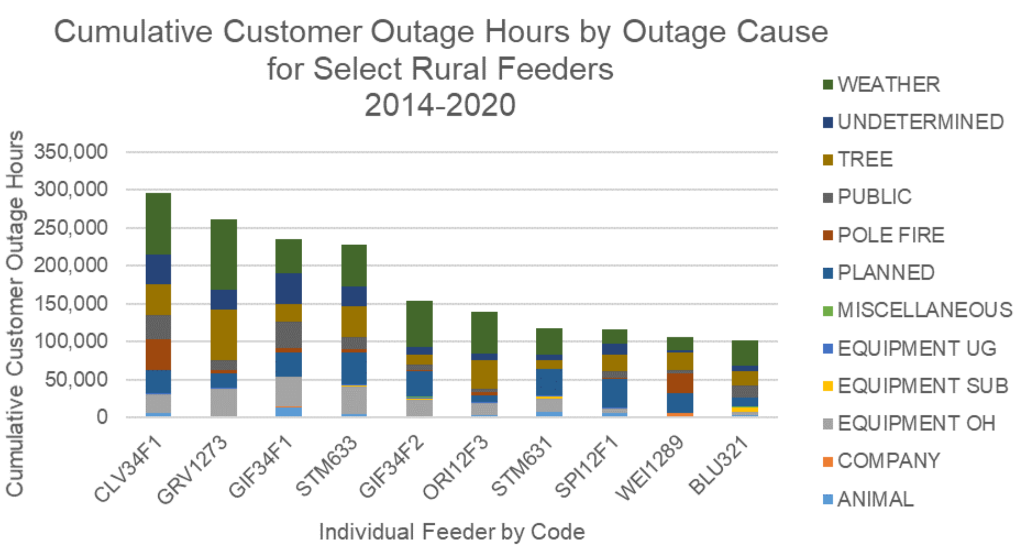

Figure 16: Cumulative Outage Hours by Feeder and Outage Cause, 2014-2020

Depending on the reliability objectives being pursued and the reliability measure determined to be important, this analysis may be useful in identifying the types of programs that could be effective in order to improve targeted performance.

Summary of Investments in Rural Feeders in 2020

Avista engineering and operations staff, apart from our ongoing Asset Maintenance programs,[23] are continuously evaluating opportunities to maintain the overall performance of the Company's rural feeders. These include specific investments that have the benefit of improving the service reliability of poorly performing circuits. Among these programs are Grid Modernization, Failed Plant and Operations, Feeder Tie and Reconductor, and Feeder Minor Rebuild. A brief summary of the program investments made in 2020 is provided in Table 9 below. In addition to the projects listed below, more than 30 Asset Replacement projects were completed, upgrading poles and equipment on portions of other rural feeders.

Feeder	Key Objectives	Work Performed	Investment
COB12F1	Reduce loading on COB12F1 which is hitting 93% of equipment rating during peak summer loading. Add Line Recloser to have acceptable margin for fault detection.	Added Viper Line Recloser, added Air Switch, and connected jumper from Buck Corner to transfer portion of COB12F1 onto COB 12F2. Performed switching to transfer portion of COB12F1 onto MLN12F2 by moving Normal Open location between feeders.	$63,000
INT12F2-DEP12F1	Eliminate voltage exceptions on INT12F2 and DEP12F1. Improve feeder fault detection and isolation for faults that occur on feeder. Balance loading on the feeders for less power losses. Improve feeder protective device coordination.	Added four sets of Line Voltage Regulators, added Viper Line Recloser, added two Air Switches, tapped laterals to balance section loading on feeder, resized fuses for successful fuse coordination.	$532,000
INT12F2	Increase capacity of Tie along Rutter Pkwy to accommodate emergency switching configuration such as picking up DEP12F1 from INT12F2.	Reconductor two miles to 556AAC.	$553,000
DEP12F1	Eliminate overloading on small overhead conductor and Mitigate low voltage exceptions.	Add single phase tie in order to balance loading on lateral, reducing load on one phase and adding to a different phase. Added line voltage regulator.	$41,000
SIP12F5	Increase capacity on section of feeder in Spokane Industrial Park to accommodate existing and new loads.	Reconductor 1/2 mile to 556AAC.	$332,000
LIB12F2-LIB12F4	Add tie line to accommodate two 2.4MW load additions in Liberty Lake.	Install 6000 feet of 600A UG trunk cable to offload portion of LIB12F4 and to accommodate new load additions in Liberty Lake area.	$509,000

[23] Avista's Asset Maintenance programs include Wood Pole Management, Vegetation Management, Street Lighting, and Overhead Transformer Changeout.

Feeder	Key Objectives	Work Performed	Investment
SPL361	Bay Crossing Conversion	Convert exiting 1300 feet of overhead primary crossing to underwater cable on south side of Spirit Lake. The existing overhead crossing often goes down during winter, impacting customer reliability and worker safety to restore.	$100,000
CKF711-ODN732	Three new Viper reclosers	Replace ODN732 Trestle Creek regulators with new Smart Regulators. Install new smart viper switches ZC4S86R & Z4S60R to replace existing air switches. Replace recloser 4S61 with smart viper recloser Z4S61R. This will allow for better feeder protection and allow for remote distribution switching capability through the DMS.	$260,000
ODN731	Sunnyside reroute	Reroute 1800' of 2-ph OH line along Sunnyside Rd near Kaniksu Shores to move line next to the road, using 2/0ACSR. Replace the 3-ph crossing of Hwy 200 with 2/0ACSR. Relocate existing Kyle Recloser 4S71 to new alignment.	$110,000
WAL543	Reconductor #6 Crapo	Reconductor two miles of #6 Crapo to improve voltage, improve fault detection, and reduce losses on the WAL543 feeder in the Pritchard area. First year of a multi-year project to remove #6 Crapo wire from this feeder	$265,000
WAL542	Remove overhead wire	Relocate/convert 3-ph line to be 4/0CN15 URD in Yellowstone Roadway. This is the feed to Lookout Pass. This will allow for eliminating a problematic section of overhead line and will allow for improved fuse coordination.	$110,000
BLU321	Overhead to Underground Conversion	Convert 1ph OH 6A/4ACSR to underground along Blue Creek Road. Cascade Cable to plow in about 3900ft of direct buried #1-15kv primary cable. Set JE1 near Dry Creek crossing. Conduit installed under creek. Hwy district will change out the culvert in future. Install new primary riser poles at both ends.	$64,000
COT2402	Install recloser	Installed 3 Phase Kyle OCR on Sandspur Road to replace fuses. Area is prone to "Unknown Cause" outages, many of which should be reduced to momentary outages by installing this Recloser	$32,000
CRG1261	Line rebuild	Replaced approximately 3500 ft. of deteriorated 4cu conductor with new 2/0 ACSR, and replaced most of the poles to improve reliability	$75,000

Feeder	Key Objectives	Work Performed	Investment
NLW1222-LM41530 Tie	Intertie	Multi-year project to establish a tie between NLW1222 and LMR1530. There are currently no ties from North Lewiston to any other circuits. A span across the Clearwater River was completed in 2019, a connection to NLW1222 on the north side, and some work on the south side was done in 2020, and the remaining work on the south side of the river will be completed in 2021.	$150,000
POT321	Conductor replacement	Replaced approximately 750ft of overhead conductor above a playground with underground conductor, improving safety and reliability.	$89,000
LEO611	Conductor replacement	Replace approximately 6,200 feet of deteriorated single phase 6cu conductor and poles on Martinson Road with 1CN15 underground cable to improve reliability	$75,000
GIF34F2	Asset Replacement	Replaced wood poles damaged by wildlife with ductile iron poles, supporting the Columbia River Crossing near Gifford.	$115,000
MIS431	Grid Modernization feeder rebuild to achieve multiple objectives.	Application of Avista's ongoing Grid Modernization Program to replace assets based on end of life, manage capacity issues and long-term O&M costs, and to improve service reliability.	$903,800
SPR761	Grid Modernization feeder rebuild to achieve multiple objectives.	Application of Avista's ongoing Grid Modernization Program to replace assets based on end of life, manage capacity issues and long-term O&M costs, and to improve service reliability.	$2,277,112
MIS431	Grid Modernization automation installations	Installed a viper recloser, a viper tie switch, and a Kyle recloser	$132,142
COT2401, COT2402	Grid Hardening feeder reducing wildfire hazards and impact in elevated areas of risk	Application of Avista's ongoing Grid Hardening Program to address and mitigate the risk and impact of wildfire while also accomplishing improvements to protection equipment coordination.	$1,601,649
SPR761, EWN241, LAT421, ROK451	Grid Hardening feeder reducing wildfire hazards and impact in elevated areas of risk	Application of Avista's ongoing Grid Hardening Program to address and mitigate the risk and impact of wildfire while also accomplishing improvements to protection equipment coordination.	$1,513,271

Table 9: Brief Summary of Feeder Investments in 2020

Appendices

Appendix A - Definitions

Baseline reliability statistic - Avista will compare its reliability statistics to the year 2005.

Commission Complaint - When a customer is not satisfied with the Company as it relates to electric reliability and files a complaint directly with the Commission.

Customer Complaint - When a customer is not satisfied with the Company as it relates to electric reliability and makes a complaint directly to a Company representative.

Electric Service Reliability - The continuity of electric service experienced by retail customers.

Electric System Reliability Reporting Requirements - The minimum reporting requirements are as follows:

> *(1) The report must be consistent with the electric service reliability monitoring and reporting plan filed under WAC 480-100-393. As set forth in the plan, in an identified year, baseline reliability statistics must be established and reported. In subsequent years, new reliability statistics must be compared to the baseline reliability statistics and to reliability statistics from all intervening years. The utility must maintain historical reliability information necessary to show trends for a minimum of seven years.*
>
> *(2) The report must address any changes that the utility may make in the collection of data and calculation of reliability information after initial baselines are set. The utility must explain why the changes occurred and explain how the change is expected to affect comparisons of the newer and older information. Additionally, to the extent practical, the utility must quantify the effect of such changes on the comparability of new reliability statistics to baseline reliability statistics.*
>
> *(3) The report must identify the utility's geographic areas of greatest reliability concern, explain their causes, and explain how the utility plans to address them.*
>
> *(4) The report must identify the total number of customer complaints about reliability and power quality made to the utility during the year and must distinguish between complaints about sustained interruptions and power quality. The report must also identify complaints that were made about major events.*

Full-system - All equipment and lines necessary to serve retail customers whether for the purpose of generation, transmission, distribution or individual service.

Interruption Cause Code - Used to describe the cause of an interruption (i.e., animal, tree, public, etc.).

Major Event - Designates an event that exceeds reasonable design and or operation limits of the electric power system. A Major Event includes at least one Major Event Day (MED).

Major Event Day - A day in which the daily system SAIDI exceeds a threshold value, T_{MED}. For the purposes of calculating daily system SAIDI, any interruption that spans multiple calendar days is accrued to the day on which the interruption began. Statistically, days having a daily system SAIDI greater than T_{MED} are days on which the energy delivery system experienced stresses beyond that normally expected (such as severe weather). Activities that occur on major event days should be separately analyzed and reported.

Momentary Event Interruption - An interruption of duration five minutes or less. Each event consists of a single trip and reclose operation that occurs within five minutes. For example, if an interrupting device operates three times and then holds the circuit energized, this would be counted as three events with the number of customers affected as three times the N_i.

Power Quality – Characteristics of electricity, primarily voltage and frequency, that must meet certain specifications for safe, adequate and efficient operations.

Reliability Statistic – Standard Statistics measures and calculation methods are per the IEEE Standard P1366-2012 (or latest version) titled *IEEE Guide for Electric Power Distribution Reliability Indices*. Same as Reliability Indices.

Sustained Interruption - An interruption lasting longer than five minutes.

Appendix B - Index Calculations

SAIFI – System Average Interruption Frequency Index

- The average number of sustained interruptions per customer
- = The number of customers which had ***sustained interruptions*** / Total number of customers served
- $= \dfrac{\sum N_i}{N_T}$

$MAIFI_E$ – Momentary Average Interruption Event Frequency Index

- The average number of momentary interruption events per customer
- = The number of customers which had ***momentary interruption events*** / Total number of customers served
- $= \dfrac{\sum ID_E N_i}{N_T}$
- MAIFI can be calculated by one of two methods. Using the number of momentary interruptions or the number momentary events. This report calculates $MAIFI_E$ using momentary events. The event includes all momentary interruptions occurring within five minutes of the first interruption. For example, when an automatic interrupting device opens and then recloses two, or three times before it remains closed, it is considered a single event.

SAIDI – System Average Interruption Duration Index

- Average sustained outage time per customer
- = Outage duration multiplied by the customers effected for all ***sustained interruptions*** / Total number of customers served
- $= \dfrac{\sum r_i N_i}{N_T}$

CAIDI – Customer Average Interruption Duration Index

- Average restoration time
- = Outage duration multiplied by the customers effected for all ***sustained interruptions*** / The number of customers which had ***sustained interruptions***
- $= \dfrac{\sum r_i N_i}{\sum N_i}$

Quantities:

i = An interruption event;
r_i = Restoration time for each interruption event;
T = Total;
ID_E = Number of interrupting device events;
N_i = Number of interrupted customers for each interruption event during the reporting period;
N_T = Total number of customers served for the area being indexed;

$CEMI_n$ – Customers Experiencing Multiple Sustained Interruptions more than *n*.

- $CEMI_n$
- = Total Number of Customers that experience more than *n* **sustained interruptions** / Total Number of Customers Served
- $= \frac{CN_{(k>n)}}{N_T}$

$CEMSMI_n$ – Customers experiencing multiple sustained interruption and momentary interruption events.

- $CEMSMI_n$
- = Total Number of Customers experiencing more than *n* **interruptions** / Total Number of Customers Served
- $= \frac{CNT_{(k>n)}}{N_T}$

MED - Major Event Day

A major event day is a day in which the daily system SAIDI exceeds a threshold value. Its purpose is to allow major events to be studied separately from daily operation, and in the process, to better reveal trends in daily operation that would be hidden by the large statistical effect of major events.

The MED identification threshold value, T_{MED}, is calculated based on the IEEE P1366-2012 Standard. T_{MED} is calculated at the end of each reporting period, typically one year, for use during the next reporting period as follows:

a) Collect values of daily SAIDI for five sequential years ending on the last day of the last complete reporting period. If fewer than five years of historical data are available, use all available historical data until five years of historical data are available.
b) Only those days that have a SAIDI/Day value will be used to calculate the T_{MED} (do not include days that did not have any interruptions).
c) Take the natural logarithm (*ln*) of each daily SAIDI value in the data set.
d) Find α (Alpha), the average of the logarithms (also known as the log-average) of the data set.
e) Find β (Beta), the standard deviation of the logarithms (also known as the log-standard deviation) of the data set.
f) Compute the major event day threshold, T_{MED}, using equation (25).

$$T_{MED} = e^{(a+2.5\,b)}$$

g) Any day with daily SAIDI greater than the threshold value T_{MED} that occurs during the subsequent reporting period is classified as a major event day. Activities that occur on days classified as major event days should be separately analyzed and reported.

When an event has reached the threshold to constitute a MED described in subpart (f) above, all outage incidents associated with the MED will be flagged in the Company's Outage Management Tool. As the Company further assesses damage in the field while making repairs, new subsequent outage incidents that were a result of the MED may be created as more accurate information is made available. The subsequent incidents will be flagged and included as part of original outage event and MED.

Methodology for Calculating CEMI

The IEEE Standard P1366-2012 provides for two methods to analyze data associated with customers experiencing multiple momentary interruptions and/or sustained interruptions. Avista's Outage Management Tool (OMT) and Geographical Information System (GIS) provide the ability to geospatially associate an outage to individual customer service points. This association allows for graphically showing Customers Experiencing Multiple sustained Interruptions ($CEMI_n$) with Major Event Day data included onto

GIS produced areas. Data can be exported to Excel to also create graphs representing different values of *n*. The calculation for $CEMI_n$ and Customers Experiencing Multiple Sustained and Momentary Interruptions $CEMSMI_n$ is provided in Attachment B of the Standard.

Avista has used the data from the OMT system integrated with the GIS system to geospatially display reliability data for specific conditions. The specific conditions imply looking at the number of sustained interruptions for each service point, such as a meter point. This process would be similar to the SAIFI index but related to a certain number of sustained interruptions. Avista includes all sustained interruptions including those classified under Major Event Days. This provides a view of what each customer on a specific feeder experiences on an annual basis. Momentary Interruptions are not included in the $CEMI_n$ index because by IEEE definition only applies to sustained outages. Other Momentary Indices are not included because of the lack of indication at many rural substations and line locations.

Appendix C - Methods and Measures

WAC 480-100-398 (2) requires the Company to report changes made in data collection or calculation of reliability information after initial baselines are set. This section addresses changes that the Company has made to data collection.

Since Avista's Electric Service Reliability Monitoring and Reporting Plan was filed in 2001 (UE-011428), there have been several improvements in the methods used to collect outage data. In late 2001, centralizing the distribution trouble dispatch and data collection function for Avista's entire service territory began. The distribution dispatch office is located at the Spokane headquarters complex. At the end of September 2005, 100% of the Company's feeders, accounting for 100% of the customers, are served from offices that employ central dispatching.

The data collected for 2020 represents almost twenty years of outage data collected through the Outage Management Tool (OMT). Since 2016, all data has been collected using OMT based on the Company's Geographic Information System (GIS). The OMT system automates the logging of restoration times and customer counts.

Even as good as the OMT system is at quantifying the number of customers and duration of the outage duration, there still are areas where the data collection is not precise. Determining the exact starting time of an outage is dependent on when a customer calls in, how well the Avista Distribution Dispatcher determines where the outage is and defines the device that has opened to remove the faulted section.

As AMR and AMI metering reaches full implementation and the customer meter provides outage information to the OMT system through an interface, the SAIDI and CAIDI numbers are expected to increase, consistent with the discussion above.

Use of the OMT system and GIS data has improved the tracking of the numbers of customers without power, allowed for better prioritization of the restoration of service, and the improved dispatching of crews.

Beginning with the report for 2020, a minor revision to the number of MED outages for 2015 has been incorporated. The original sustained outage data used in the creation of this report had some outages that occurred in November 2015 erroneously excluded from the MED dataset. When the comprehensive data extract of sustained outage data from 2015 was refreshed, the identified outages from November 2015 were now correctly included as MED datapoints. Most reliability calculations exclude MED designated outages, so some minor changes may impact the results for 2015.

Appendix D - Areas of Greatest Concern

Please see Table 8, above, for the Company's current listing of its worst performing feeders based on current service reliability results. Figure 15 also provides feeder specific information related to outage causes by reason and sub-reason, and Figure 13 represents the outage events based on feeder classifications. As noted in the discussion above, because there are several approaches for determining "worst" performance, the designation of worst performing feeders should be informed by the reliability objectives the Company is intending to achieve. Avista continues to develop and update electric system reliability performance measures and strategic supporting plans in order to improve the reliability of its electric system.

Appendix E – Customer Complaint Summary

Commission Complaints are customer issues that require investigation and resolution by the Commission and are recorded in the UTC's Consumer Complaint Database. Complaint categories include power quality, electric reliability, or major events. This table summarizes the Commission Complaints that occurred during 2020.

Commission Complaints			
Customer Location (Feeder)	**Complaint**	**Category**	**Resolution**
Pullman, Washington (TVW132)	CAS-26484-T9B3N4: A transformer malfunction is claimed to have caused damage inside the customer's home. The customer is frustrated Avista has been granted a rate increase but its facilities in the area are not providing adequate service.	Outages	Company Upheld
Spokane Valley, Washington (BKR12F3)	CAS-27169-N1C8B4: The customer experienced a voltage fluctuation that caused considerable damage to various appliances and equipment at the site. The customer believes the voltage fluctuation is due to Avista's negligence rather than an Act of God. When Avista lineman visited the site on April 10, a terminal was removed from service and provided to the customer with an indication the damages were due to faulty terminal installed by Avista. A third-party electrician was hired by the customer and confirmed the terminal installed by Avista was faulty and was the likely cause of the voltage fluctuation and resulting damage. The customer is seeking compensatory damages. The customer is seeking information about the service repair tickets from March 16 and April 10.	Outages	Company Upheld
Kettle Falls, Washington (CLV34F1)	CAS-27296-H9K5N9: The customer states there have been five power outages in their area in the last month which have lasted several hours. Only one of those outages was planned. The customer advised outages occur even when there is no bad weather or any other apparent reason. The customer requests Avista schedule a local town hall meeting to discuss the residents' concerns about the unreliable infrastructure in the area and to explain how service will be improved in the future.	Outages	Company Upheld

Customer Complaints are customer issues received by the Company specifically related to power quality, electric reliability, or major events. These complaints are managed and tracked internally by the Company. This table summarizes the Customer Complaints that occurred during 2020.

Customer Complaints			
Customer Location (Feeder)	**Complaint**	**Category**	**Resolution**
Ritzville, Washington (RIT731)	Customer stated outages occurred every night for a week between midnight and 5:00 a.m. Wants explanation for what is happening and when it will stop.	Outages	Customer was contacted and provided explanation regarding transmission insulator failures that should be addressed in the following week. Customer was satisfied with conversation and will call if outages occur again.
Spokane, Washington (ROS12F3)	Customer stated concerns about a planned outage and elderly customers.	Outages	Customer was contacted with assurances of minimizing the outage duration.
Ritzville, Washington (RIT731)	Customer shared concerns about perceived neglected maintenance of the power poles in the area and insufficient staffing for prompt restoration. Customer would like follow-up communication from management.	Outages	Customer was contacted and advised of planned programmatic work to replace and rebuild older poles and transformers that is scheduled for 2022.
Colville, Washington (CLV12F4)	Customer requested contact with a manager that can resolve the outage issues in this area.	Outages	Customer was contacted and provided information regarding overview of maintenance activities and costs associated with underground services.
Kettle Falls, Washington (GRN12F1)	Customer is concerned about the number of outages experienced over the year with claims about outdated equipment and excuses. Customer is interested in having a different utility company provide services. Customer requested a return call with information about plans for equipment updates and operational changes to minimize outages.	Outages	Customer was contacted and provided requested information. Informed that only four outages were recorded in the past year.
Kettle Falls, Washington (SPI12F1)	Customer would like a call back from the person in charge of planned outage scheduling. Would prefer outages be scheduled for evenings to not interfere with morning activities. Encourages additional communication with area residents.	Outages	Customer was contacted with assurances of scheduling considerations and additional customer communication.
Spokane Valley, Washington (GRA12F1)	Customer is concerned about the timing of a planned outage on November 13.	Outages	Customer was contacted and confirmed timing accommodation.
Kettle Falls, Washington (KET12F2)	Customer expressed concern about having 3-4 power outages this year with concerns about tree trimming.	Outages	Customer was contacted and provided general information about wildfire resiliency plan.

Customer Complaints			
Customer Location (Feeder)	**Complaint**	**Category**	**Resolution**
Lind, Washington (LIN711)	Customer placed multiple calls regarding a current outage. Sought lodging accommodations and schedule updates.	Outages	Customer was called and message left. No further contact.
Mead, Washington (COB12F2)	Customer was concerned about planned outage with during high temperatures. Planned outage was scheduled for 9:00 a.m. to 1:00 p.m.	Outages	Customer conversation resulted in no further action.
Pullman, Washington (TUR112)	Customer requested contact from a manager due to concerns about the duration of a planned outage during cold temperatures.	Outages	Customer was contacted and details of the outage scheduling were shared. Confirmed early completion of planned outage.
Sprague, Washington (Anonymous)	Customer complained about the frequency of power outages and resulting impacts at service location.	Outages	Customer conversation resulted in no further action.
Spokane, Washington (ROS12F6)	Customer believes there should be additional notification for planned outages for businesses as the four-day notice received was insufficient due to scheduling issues.	Outages	Customer was contacted and the prior notification concerns were resolved.
Spokane, Washington (3HT12F5)	Customer was concerned about 45-minute outage due to pole work in an adjacent alley, work processes of the crew, impacts to businesses, and lack of prior notification.	Outages	Multiple messages were left for the customer, but no further contact was made.
Clarkston, Washington (PDL1204)	Customer called with concerns about planned outage and impact to personal medical services equipment.	Outages	Customer was contacted by a manager and concerns were addressed.
Chewelah, Washington (VAL12F3)	Customer expressed concerns about the number of outages in the current year, estimated at 13. Had concerns about potential outages during winter and seeking additional mitigating efforts with trees in the area.	Outages	Customer was contacted and concerns discussed. Risk tree work had been completed in August and will occur on planned cycle.
Colville, Washington (CLV12F4)	Customer wished to lodge complaint regarding number of trees in area of electric lines, the increased number of outages, and desire for additional trimming maintenance.	Outages	Customer was contacted and discussed risk tree work that had been completed and the planned maintenance cycle.
Colville, Washington (CLV12F4)	Customer expressed concern about the frequency of outages and tree maintenance and removal.	Outages	Customer was contacted and discussed risk tree work that had been completed and the planned maintenance cycle.

Appendix F – Historical Summary of SAIFI and SAIDI

For reference, the SAIFI and SAIDI values for each year since 2004 are included in the table below. In addition, the rolling average of the prior five years is provided. For example, the *Prior 5-year Average* value reported for 2020 is the average of the reported values from 2015-2019.

The data for 2005 is highlighted as the baseline for Avista's reporting of annual reliability performance data.

	SAIFI		SAIDI	
Year	Reported Value	Prior 5-year Average	Reported Value (minutes)	Prior 5-year Average (minutes)
2004	1.01	--	126	--
2005	0.97	--	108	--
2006	1.29	0.99	143	117
2007	1.14	1.09	132	126
2008	1.40	1.10	159	127
2009	1.52	1.16	193	134
2010	1.23	1.26	146	147
2011	1.08	1.32	118	155
2012	1.14	1.27	138	150
2013	1.05	1.27	138	151
2014	1.11	1.20	139	147
2015	1.05	1.12	163	136
2016	0.86	1.09	133	139
2017	1.20	1.04	183	142
2018	0.81	1.05	126	151
2019	0.94	1.01	136	149
2020	0.87	0.97	129	148

Appendix G - Historical Major Event Days on Avista's System

The following table is provided as an initial review of Major Event Day information. The main premise of the IEEE Major Event Day calculation is that using the 2.5b method should classify 2.3 days each year as MEDs. This table lists the historical major event days, shows the daily SAIDI value for each MED, and reports the T_{MED} value calculated for each year.

Year	Date	SAIDI	T_{MED}
2004	5/21/2004	7.11	6.35
	08/02/2004	7.36	
	12/08/2004	31.00	
2005	06/21/2005	39.53	4.92
	06/22/2005	9.03	
	08/12/2005	19.60	
2006	01/11/2006	12.10	7.06
	03/09/2006	8.58	
	11/13/2006	30.79	
	12/14/2006	29.26	
	12/15/2006	158.31	
2007	01/06/2007	9.98	8.02
	06/29/2007	32.64	
	07/13/2007	12.79	
	08/31/2007	21.30	
2008	01/27/2008	17.57	9.22
	07/10/2008	36.74	
	08/18/2008	9.49	
2009	None		9.93
2010	5/3/2010	21.04	11.11
	11/16/2010	68.67	
2011	None		10.85
2012	1/19/2012	9.93	9.49
	12/17/2012	14.35	
2013	8/25/2013	24.97	8.96
	8/26/2013	11.78	
	9/15/2013	14.01	
	11/16/2013	11.09	
2014	7/23/14	92.95	8.72
	7/24/14	35.66	
	8/25/14	121.05	
	8/3/14	38.52	
	8/12/14	9.84	

2015	8/29/15	13.42	8.22
	9/30/15	9.99	
	11/17/15	2093.19	
	11/18/15	399.34	
	11/19/15	147.97	
	11/20/15	66.96	
	11/21/15	47.30	
	11/22/15	32.61	
	11/23/15	15.38	
	11/24/15	12.19	
	12/23/15	29.35	
	12/24/15	19.24	
2016	None		10.17
2017	12/19/17		10.19
2018	1/24/18	12.08	10.47
	11/24/18	13.30	
2019	7/23/19	26.64	9.55
	10/9/19	45.06	
2020	1/12/20	13.80	8.90
	1/13/20	9.57	
	2/1/20	12.57	
	2/23/20	9.14	
	3/14/20	9.25	
	9/7/20	94.09	
	9/8/20	15.75	
	10/23/20	35.97	
	10/24/20	15.53	
	11/13/20	21.27	
	12/6/20	10.10	

Appendix H - Interruption Cause Codes

Cause code information is provided in this report to give readers a better understanding of outage sources. Further, the Company uses cause information to analyze past outages and, if possible, reduce the frequency and duration of future outages.

Since 2011, Avista has stopped using the subcategory “protected” under the “Animal” category. Almost all birds are considered protected, so there is little differentiation between the “Bird” and “Protected” subcategories. Avista will include additional information in the Remarks section as reported from the field personnel.

MAIN CATEGORY	SUBCATEGORY	Definition
ANIMAL	Bird Squirrel Underground Other	Outages caused by animal contacts. Specific animal called out in subcategory.
PUBLIC COMPANY	Car Hit Pad Car Hit Pole Dig In Fire Tree Other Dig in Other	Underground outage due to car, truck, construction equipment etc. contact with pad transformer, junction enclosure etc... Overhead outage due to car, truck, construction equipment etc. contact with pole, guy, neutral etc. Dig in by a customer, a customer’s contractor, or another utility. Outages caused by or required for a house/structure or field/forest fire. Homeowner, tree service, logger etc. fells a tree into the line. Other public caused outages Dig in by company or contract crew. Other company caused outages

EQUIPMENT OH	Arrestors Capacitor Conductor/Pri Conductor/Sec Connector/Pri Connector/Sec Crossarm/rotten Cutout/Fuse Insulator Insulator Pin Other Pole/Rotten Recloser Regulator Switch/Disconnect Transformer/OH Wildlife Guard	Outages caused by equipment failure. Specific equipment called out in subcategory. Wildlife guard failed or caused an outage
EQUIPMENT UG	URD Cable/Pri URD Cable/Sec Connector/Sec Elbow Junctions Primary Splice Termination Transformer/UG Other	Outages caused by equipment failure. Specific equipment called out in subcategory.
EQUIPMENT SUB	High side fuse Bus Insulator High side PCB High side Swt/Disc Lowside OCB/Recloser Low side Swt/Disc Relay Misoperation Regulator Transformer Other	
MISCELLANEOUS		For causes not specifically listed elsewhere
NOT OUR PROBLEM (*Outages in this category are not included in reported statistics*)	Customer Equipment Other Utility	Customer equipment causing an outage to their service. If a customer causes an outage to another customer this is covered under Public. Outages when another utility's facilities cause an outage on our system.
POLE FIRE		Used when water and contamination cause insulator leakage current and fire. If insulator is leaking due to material failure list under equipment failure. If cracked due to gunfire use customer caused other.

PLANNED TREE UNDETERMINED	Maintenance/Upgrade Forced Tree fell Tree growth Service Weather	Outage, normally prearranged, needed for normal construction work. Outage scheduled to repair outage damage. For outages when a tree falls into distribution primary/secondary or transmission during normal weather. Tree growth causes a tree to contact distribution primary/secondary or transmission during normal weather. For outages when a tree falls or grows into a service. When snow or windstorms cause a tree or branch to fall into or contact the line. Includes snow loading and unloading. Use when the cause cannot be determined.
WEATHER	Snow/Ice Lightning Wind	Outages caused by snow or ice loading or unloading on a structure or conductor. Use weather tree for snow and ice loading on a tree. Lightning flashovers without equipment damage. Equipment failures reported under the equipment type. Outages when wind causes conductors to blow into each other, another structure, building etc.