Reliability Assessment: City of Olmos Park

Report Date: 10/15/2021

Reliability Assessment Date Range: 6/01/2016 – 6/01/2021

Customer: City of Olmos Park via City Manager Celia Deleon

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Executive Summary

City of Olmos Park requested a five-year reliability assessment for the entire City of Olmos Park. The requested analysis covers outages, infrastructure, and vegetation efforts for the circuits supplying the City of Olmos Park. Olmos Park has three separate circuits supplying 1173 customers. The three circuits supplying Olmos Park are shared among adjacent cities. Following the reliability assessment request, CPS Energy will deliver a final report with observations, findings, and if necessary, recommendations to improve reliability and mitigate outages.

The City of Olmos Park has experienced both short- and long-duration outages within the date range from 6/01/2019 – 6/01/2021. Outages sustained are typically due to electrical faults occurring on the system from either equipment failure or tree interference due to inclement weather. After analyzing the two-year outage data, it was determined that 2019 had the most outages over the past two years. Breaking the outage data down even further shows May and June have the most outage occurrences with inclement weather/thunderstorms and trees being the primary culprits. Inclement weather and trees equate to 68.6% of the total outages sustained in the City of Olmos Park shown in figure 2 below. This outage cause percentage and monthly outage timeframe correlate with typical weather patterns seen in the San Antonio area during late spring early summer. Inclement weather can cause lightning strikes to damage equipment or cause trees to obstruct power lines resulting in the outages sustained in Olmos Park. Section 2.1 below will further breakdown outage causes, and trends experienced in Olmos Park.

In addition to the outage history data the City of Olmos Park has requested a review of the infrastructure within their city limits. The City of Olmos Park is supplied by three separate circuits all from the Olmos substation. Two of the three circuits supply roughly 95% of Olmos Park. To classify the state of the infrastructure the age of equipment in the field was analyzed to determine the resiliency of the infrastructure for Olmos Park. Three types of equipment were evaluated to give a review of the infrastructure for Olmos Park. The equipment selected for this analysis include support structures (poles), both overhead and pad mount transformers, overhead and underground power lines. These three pieces of equipment are the most critical assets that serve the City of Olmos Park and have the most interest to CPS Energy. Section 2.2 below will go into further detail regarding the analysis of the infrastructure within Olmos Park.

Finally, this report will also discuss vegetation management efforts for the City of Olmos Park. A majority of Olmos Park is powered by overhead power lines. Overhead power lines are susceptible to inclement weather and outside forces such as animals, tree interference, and lightning strikes that could lead to both short- and long-duration outages. Based on data collected outstanding vegetation has been identified and is being reassessed. Tree trimming has been conducted on the circuits supplying Olmos Park in 2017, 2018, and 2021. Section 2.3 below will go into further detail about the findings for vegetation management in Olmos Park.

1. Introduction

An analysis of two years' worth (2019 – 2021) of outage data for the City of Olmos Park was conducted to determine outage causes and trends to indicate areas for improvement. In addition, an analysis of five years' worth (2016 – 2021) of infrastructure, and vegetation data for the City of Olmos Park was conducted to determine the status of infrastructure and vegetation management. This report uses age as the main metric for determining the status of the infrastructure within Olmos Park. This report will deliver the findings regarding the reliability of customers living in the City of Olmos Park as well as address recommendations to improve customer reliability.

2. City of Olmos Park Findings

2.1. Outage History (Excluding Winter Storm Uri)

City of Olmos Park is powered by three separate circuits that also span to adjacent cities bordering Olmos Park. An analysis of two years' worth (6/01/2019 – 6/01/2021) of outage history data was reviewed to determine outage causes and trends. The initial observations from the outage history data shows 2019 has had the most outages within the last two years. The outage history data shown in figure 1 below depicts how many outages in total were sustained by month within the two-year range. Figure 1 below also shows that May, June, and November are the months that have sustained the most outages throughout the two-year period being investigated. These three months with the most outages coincide with the data from figure 2 below. Figure 2 below shows the percentage of the outage causes experienced by Olmos Park. From figure 2, 40.4% of the outages sustained were the result of inclement weather. The second most common outage was trees totaling at 28.2%. CPS Energy equipment failure should also be considered when factoring inclement weather and trees as outage causes. Most overhead CPS Energy equipment is damaged from severe weather and overgrown trees. These three-outage cause's total of 74% of all the outages experienced by Olmos Park within the last two years. The data from figure 1 coincides with the data from figure 2 due to the type of weather experienced in the months of May, June, and November.

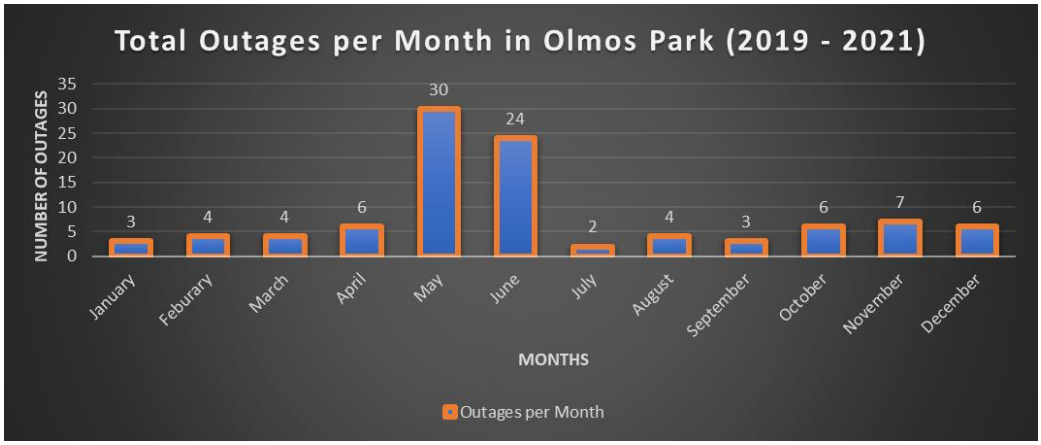

Figure 1: Total Outages per Month in Olmos Park (2019 – 2021)

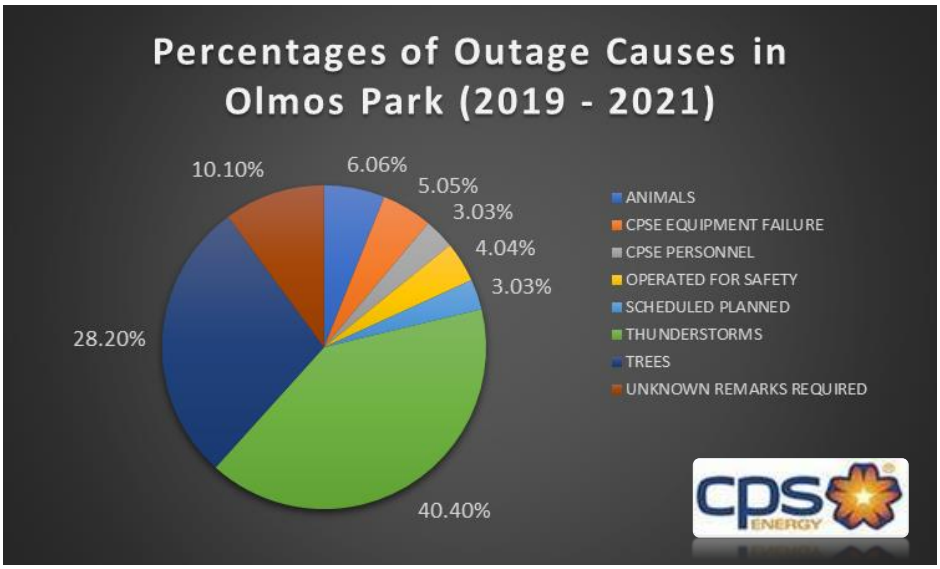

Figure 2: Percentage of Outage Causes in Olmos Park (2019 – 2021)

2.2. Outage History (Winter Storm Uri)

Winter Storm Uri was a major winter and ice storm that brought frigid temperatures to Texas lasting from February 13th to the 17th. An analysis of the Winter Storm Uri outages experienced by the City of Olmos Park was conducted to determine how Olmos Park faired when compared to San Antonio as a whole. Number of homes without power and outage durations are the criteria comparing Olmos Park to San Antonio for outages experienced during Winter Storm Uri. The weather brought in by Winter Storm Uri was unprecedented and required shedding load due to the potential failure of the entire Texas electrical grid. Rolling blackouts were implemented via state mandates from the Electric Reliability Council of Texas (ERCOT) to ensure there wasn't total grid failure. Load shedding is used to alleviate stress on a primary energy source when the demand for energy is larger than what the source can provide.

Olmos Park is powered by three separate circuits to diversify and sectionalize how Olmos Park receives electricity. During Winter Strom Uri only one of the circuits powering Olmos Park experienced rolling blackouts to accommodate for shedding load. The circuit that experienced outages due to Winter Storm Uri had outages on February 15th and 16th. The residents receiving power from the circuit experiencing outages from Winter Storm Uri were without power for a total of 24 hours non-consecutively. Roughly 273 residents out of a total of 1173 residents in Olmos Park experienced outages from Winter Storm Uri. Figure 3 below shows the load shed by zip code experienced from Winter Storm Uri. Figure 3 below helps compare what residents experienced from Winter Storm Uri to San Antonio as a whole.

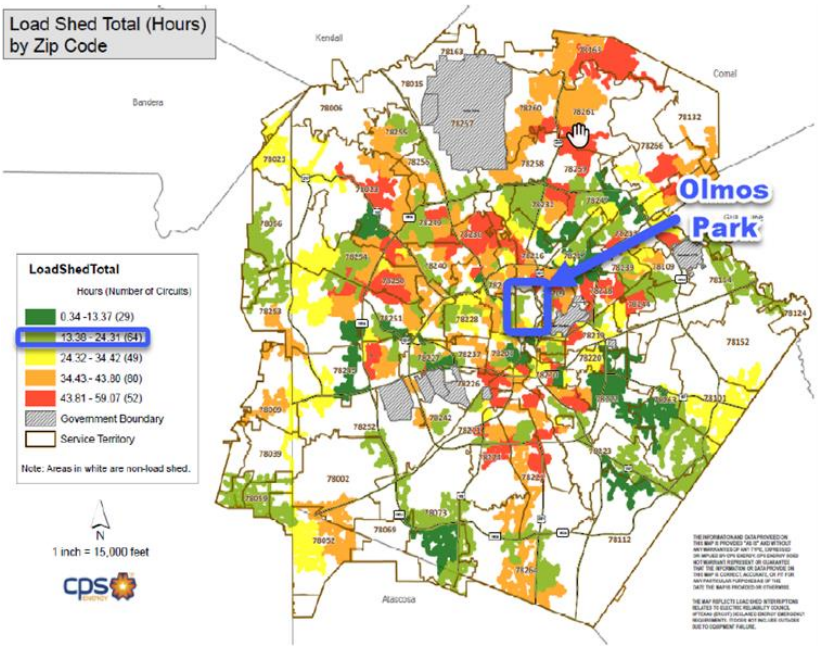

Figure 3: Load Shed Map by Zip Code for outages experienced from Winter Storm Uri (Referenced *CoSA Community Emergency Preparedness Committee Report*)

2.3. Infrastructure Review

An analysis of five years' worth (6/01/2016 – 6/01/2021) of infrastructure data was reviewed to determine the status of the infrastructure within Olmos Park. The sections below will address three different CPS Energy structure/devices that effectively showcase the status of the infrastructure in Olmos Park. These three pieces of equipment were chosen because they are the most common assets that serve the City of Olmos Park and have the most interest to CPS Energy. Finally, the last section will go in depth about capital infrastructure projects that have been completed or planned within the last five years for the City of Olmos Park.

2.3.1. Support Structures / Poles

There is a total of 264 support structures (poles) throughout the City of Olmos Park. The support structures are incrementally placed and are responsible for holding power lines and other CPS Energy equipment. To determine the status of the infrastructure within Olmos Park the age of the support structures (poles) was analyzed. The data shown in figure 4 below depicts the installation date percentages of the support structures in Olmos Park. Roughly 93% of all the support structures in Olmos Park were installed from 1996 onward while the remaining 7% of the poles were installed on or prior to 1995. After inspecting the data further an average age of 10.9 years was observed out of the total number of support structures within Olmos Park shown in figure 4. The average age of the support structures within Olmos Park is well within the healthy lifecycle of wooden support structures.

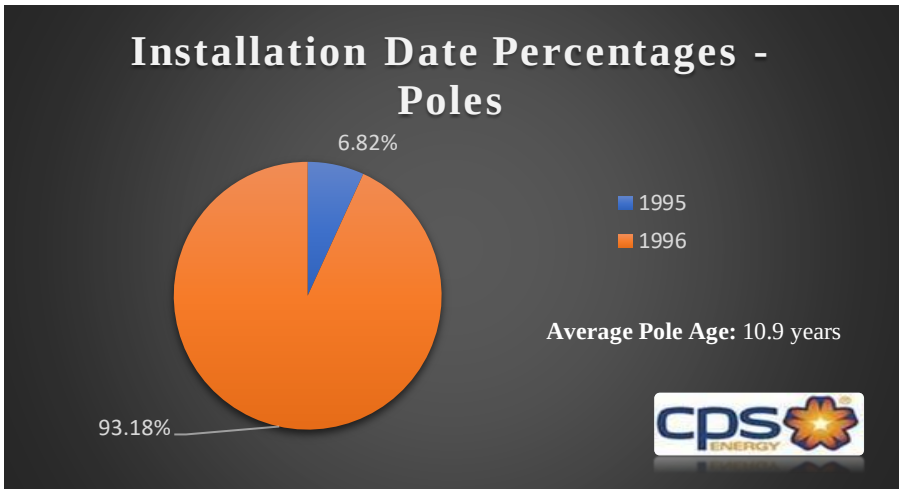

Figure 4: Installation Date Percentages for Support Structures (Poles) in Olmos Park

2.3.2. Transformers

Transformers are devices that increase or decrease the voltage supplied to a customer or facility. There is a total of 398 transformers throughout the city of Olmos Park. A total of 96% of all the transformers in Olmos Park are on overhead power lines. The age of transformers was analyzed to help determine the status of the infrastructure within Olmos Park. The data shown in figure 5 below depicts the installation date percentages of the transformers in Olmos Park. Roughly 65% of all the transformers in Olmos Park were installed from 1995 onward while the remaining 35% were installed on or prior to 1994. From the same dataset an average transformer age of 24.7 years was observed out of the total number of transformers within Olmos Park shown in figure 5. Roughly 65% of the transformers in Olmos Park have an average age that is halfway through a transformer's lifecycle. While the remaining 35% are within the later stages of a transformer's lifecycle. However, the transformers within Olmos Park have not shown signs of distress or malfunctions.

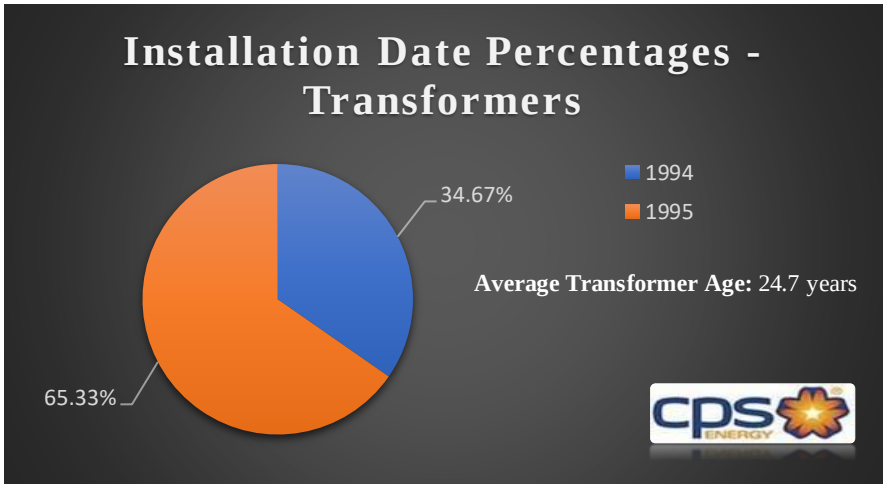

Figure 5: Installation Date Percentages for Transformers in Olmos Park

2.3.3. Overhead & Underground Power Lines

Overhead and underground power lines carry the electricity from power generation plants to the customer. Overhead power lines are the standard for CPS Energy and are the easiest to maintain. Undergrounding power lines, while not the standard practice is implemented in cases where clearance for overhead power lines would be an issue. On the other hand, overhead power lines are susceptible to inclement weather and outside forces such as animals, tree interference, and lightning strikes that could lead to both short- and long-duration outages.

The third piece of equipment to determine the status of the infrastructure in Olmos Park is the age of the overhead and underground power lines that supply Olmos Park. Figure 6 below depicts the installation date percentages of the overhead power lines. Roughly 70% of the overhead power lines in Olmos Park were installed 2010 and onward and the remaining 30% were installed on or prior to 2009. Out of the total overhead power lines an average age of 9.1 years was observed. Figure 7 below depicts the installation date percentages of underground power lines. Roughly 67% of the underground power lines in Olmos Park were installed 2010 and onward and the remaining 33% were installed on or prior to 2009. Out of the total underground power lines an average age 8.2 years was observed. The industry standard lifespan of overhead power lines is 40 years while underground power lines are 35 years. A large majority of both overhead and underground power lines are within a healthy lifespan for coaxial power cables.

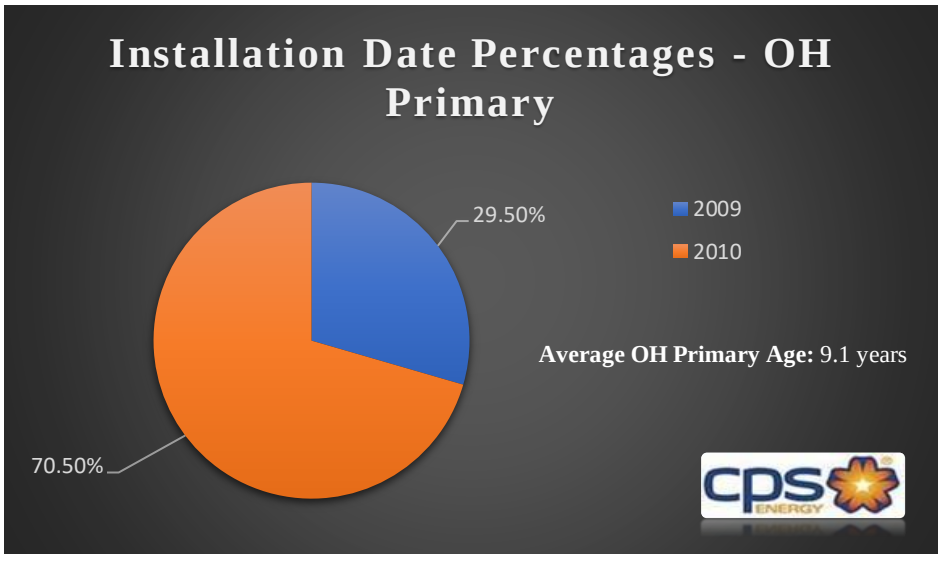

Figure 6: Installation Date Percentages for Overhead (OH) Primaries in Olmos Park

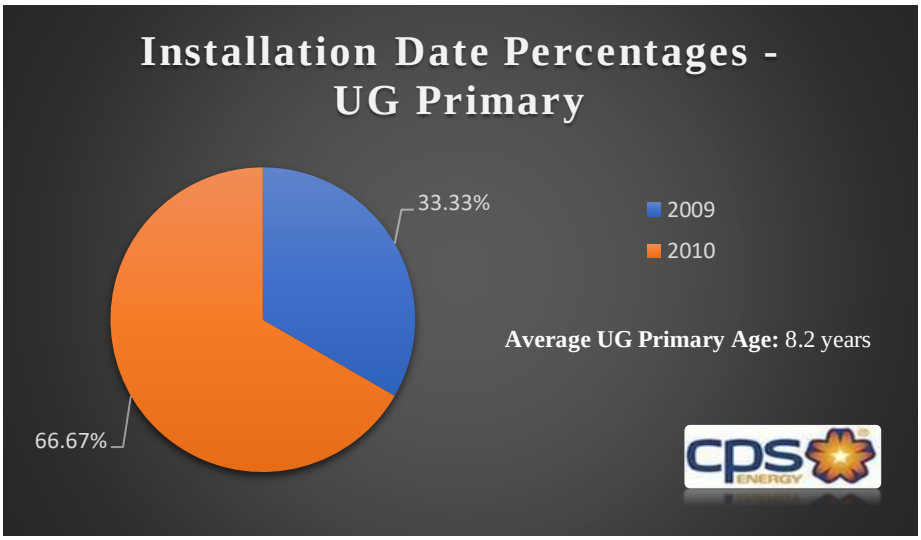

Figure 7: Installation Date Percentages for Underground (UG) Primaries in Olmos Park

2.3.4. Capital & Maintenance Work

Capital work is classified as any projects that incorporate major infrastructure changes to improve reliability or adjust for growth in a region. Maintenance work is classified as any jobs to improve existing infrastructure or replace faulty equipment. Over the course of the past five years (2016 – 2021) there has been a total of 20 capital infrastructure projects invested into the City of Olmos Park. In addition, there has been 69 maintenance jobs completed in Olmos Park from 2016 to 2021 shown in figure 9 below. Figure 8 below showcases the total number of capital projects undertaken in the City of Olmos Park within the past five years per year.

Capital projects range in size from installing a single piece of equipment to large scale infrastructure updates to improve reliability or adjust for growth. In 2016 there was a total of 11 capital projects started in Olmos Park shown below in figure 8. Most of the projects started in 2016 were pole replacements. For example, 7 out of the 11 projects conducted in 2016 were pole replacements. A total of 50 poles were replaced to update existing infrastructure. The remaining projects started in 2016 were installing circuit protection equipment, rerouting circuits to adjust for growth, and adjusting CPS Energy equipment for new streetlights.

In 2017 there was a total of five capital projects started in Olmos Park shown below in figure 8. To adjust for growth such as apartment complexes or new businesses in Olmos Park, 3 out of the 5 capital projects were rerouting of current circuits for both overhead and underground power lines. A voltage regulator bank was installed in Olmos Park to assist in maintaining a constant voltage. A voltage regulator bank will help ensure customers in Olmos Park will have power in the event the substation has a sag in voltage.

The last capital project started in 2017 was moving CPS Energy equipment for the inclusion of new traffic signals.

In 2018 there was a total of two capital projects started in Olmos Park shown below in figure 8. The first capital project undertaken in Olmos Park was the installation of a circuit protection equipment to improve reliability for customers in Olmos Park. The second capital project started in 2018 was the St. Mary's Street Project. The St. Mary's street project was started to adjust for growth in the area. The infrastructure changes are along St. Mary's street starting from E. Mistletoe street to W. Josephine street. This project replaced some of the poles in the area and moved existing poles to better adjust for the growth. The St. Mary's Street Project is also responsible for the capital project undertaken in 2019. The capital project starting in 2021 will add circuit protection equipment to improve customer reliability. The circuit protection equipment being installed in 2021 was the result of the previous reliability assessment conducted for the City of Olmos Park this year.

Maintenance work is classified as any jobs to repair or replace existing infrastructure or faulty equipment. Within the past five years (2016 – 2021) there has been a total of 69 maintenance jobs within Olmos Park. Most of these jobs were to replace equipment such as lightening arrestors and crossarms to name a few. Lightning arrestors are circuit protection equipment placed on critical equipment to protect them from possible lightning strikes. Crossarms are the wood bars on the top of poles that hold the power lines in place. Figure 9 below shows the total number comparison between capital projects and maintenance jobs. Capital projects are much larger in scale which is why there are fewer capital projects when compared to maintenance jobs in Olmos Park.

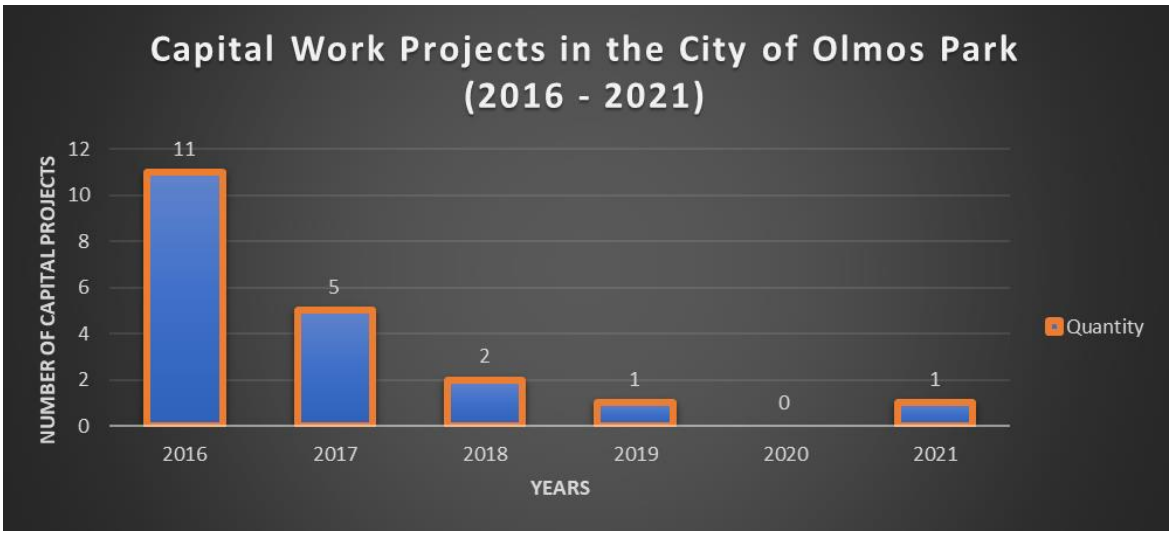

Figure 8: Totals of Capital Infrastructure Work in Olmos Park (2016 – 2021)

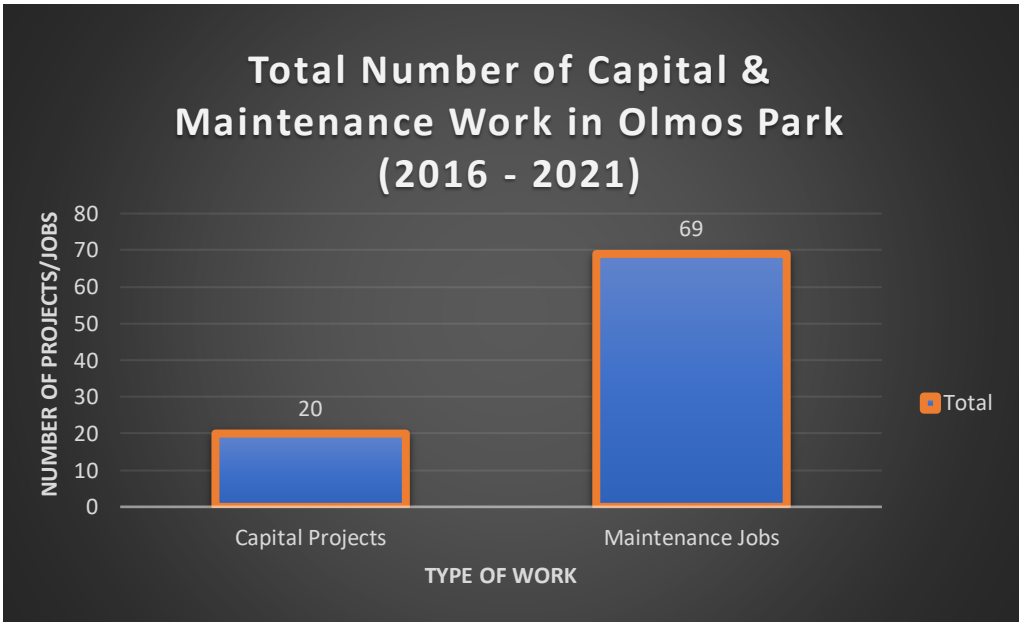

Figure 9: Total's of both Capital Projects & Maintenance Jobs in Olmos Park (2016 – 2021)

2.4. Vegetation Management

Over the course of the past five years the City of Olmos Park has had tree trimming within four regions throughout the city shown in figure 10 below. The City of Olmos Park is powered by roughly 89% of overhead power lines and the remaining 11% underground power lines. Overhead power lines are susceptible to inclement weather and outside forces such as tree interference and lightning strikes. As noted in figure 2 above 68.6% of the outages in Olmos Park are the result of inclement weather and tree interference.

Olmos Park is a heavily forested area with overhead power lines located in difficult to access areas. Two areas have been identified to have some outstanding vegetation and are in the process of being trimmed to improve reliability. Section 1 in figure 10 below trees were located and addressed in 2017 along Parklane Dr, Stanford Dr., Luther Dr., Belvidere Dr., Primera Dr., and E. Olmos Dr. Section 2 shown in figure 10 had tree trimming maintenance completed along McCullough Ave. in 2018 to address trees interfering with power lines. Section 3 in figure 10 trees were located and planned for tree trimming between Belvidere Dr. and Luther Dr. Finally, Section 4 in figure 10 trees were located and trimmed the segment between Paloma Dr. and E. Mandalay Dr. Both Section 3 and 4 are the most recent occurrence of trees interfering with power lines and CPS Energy equipment. In addition to the tree trimming maintenance six damaged crossarms were replaced in August 2018.

2.4.1. Section 1 – January 2017

- Tree Trimming Maintenance was conducted in January 2017 along Parklane Dr, Stanford Dr., Luther Dr., Belvidere Dr., Primera Dr., and E. Olmos Dr.

2.4.2. Section 2 – August 2018

- Tree Trimming Maintenance was conducted in August 2018 along McCullough Avenue to address trees interfering with power lines and CPS Energy equipment.
- Six Crossarm replacements

2.4.3. Section 3 – August 2021

- Tree Trimming Maintenance was conducted in August 2021 off Paloma Dr. & E. Mandalay Dr. to address trees interfering with power lines and CPS Energy equipment.

2.4.4. Section 4 – October 2021

- Tree Trimming Maintenance is planned for October 2021 along Belvidere Dr. & Luther Dr.

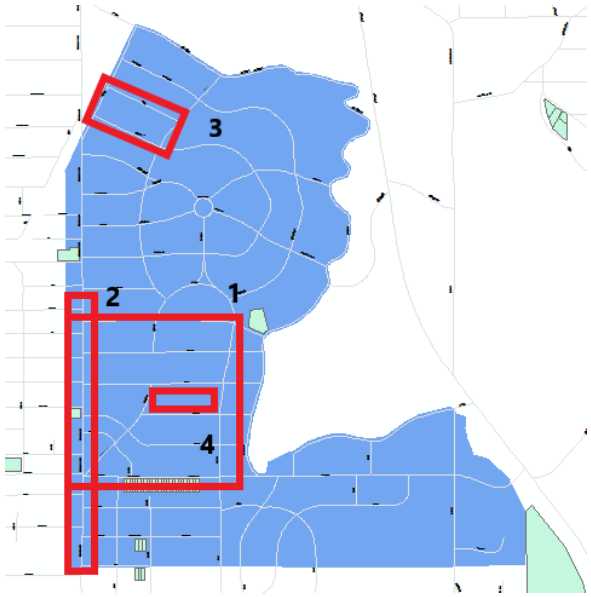

Figure 10: Tree Trimming & Maintenance Locations in Olmos Park

3. Recommendations

CPS Energy analyzed available outage, infrastructure, and vegetation data for the City of Olmos Park to assess the reliability for the residents of this area. The outage causes experienced in Olmos Park help to define what and where the problem areas are and where to begin looking. From figure 2 above 68.6% of all the outages sustained in Olmos Park in a two-year period are the result of inclement weather and trees. Olmos Park is a heavily forested area with trees being difficult to access for tree trimming efforts. CPS Energy will issue a full circuit patrol to identify overgrown vegetation to help reduce the number of outages experienced by the City of Olmos Park. Collaboration between CPS Energy and the City of Olmos Park to address vegetation will help improve reliability for the citizens residing within Olmos Park.

From the previous Reliability Assessment requested from the City of Olmos Park on July 19th, 2021, an area within Olmos Park was identified for additional circuit protection equipment. From this previous Reliability Assessment an area was identified to add additional circuit protection equipment to improve reliability for residents in Olmos Park. Currently the plans for the installation of the circuit protection equipment is in the design phase with an inspected installation date in early 2022. After the installation of this circuit protection equipment there will certainly be an improvement to customer reliability. With the adoption of more circuit protection equipment and a full circuit patrol to address vegetation will certainly improve the reliability for the residents of Olmos Park.