Gila River Indian Community Utility Authority

Report Concerning

Storm 1 - July 9, 2021

And

Storm 2 - July 10, 2021

August 19, 2021

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And
Storm 2 - July 10, 2021

1. Introduction

Districts 1-5 of the Gila River Indian Community (Community) experienced two separate back-to-back storms. The first storm occurred on the evening of Friday, July 9, 2021 (Storm 1 - July 9) and lasted approximately 45 minutes.

The second storm struck Districts 1-5 of the Community on the evening of Saturday, July 10, 2021 (Storm 2 - July 10) and lasted approximately one hour.

Storm 1 - July 9 and Storm 2 - July 10 included wind gusts, as reported at Mesa-Gateway Airport, in excess of 70 mph, heavy rain, lightning, blowing dust and a high probability of at least two microbursts. Microbursts are small concentrated downbursts that produce an outward burst of strong winds with maximum wind speeds sometimes exceeding 100 mph.

As a result of having two storms hit, Storm 1 - July 9 and Storm 2 - July 10, within twenty-four hours of each other, the GRICUA transmission and distribution system experienced the most severe damage on record. This report provides an explanation of GRICUA's restoration philosophy; a detailed description of the impact, response and recovery; and answers to commonly asked questions.

2. GRICUA Safety and Restoration Philosophy

The electric utility line-worker profession is ranked by federal safety standards as one of the most dangerous occupations. The number one daily priority for GRICUA is safety. During storm restoration, safety becomes even more critical. GRICUA continually trains our line-workers to think safety first. The GRICUA Board of Directors and management team cultivates this philosophy to all employees in our organization.

Storm restoration is especially dangerous. GRICUA's senior line-workers have catastrophic storm restoration experience and demonstrated sound judgement and skill throughout the restoration process. The GRICUA staff and contract crews experienced no safety incidents for this restoration. It should also be noted that the restoration crews were provided rest periods. Rest periods were typically from 11:00 PM to 5:00 AM the next morning. Further, GRICUA continued its normal practice of having a crew on-call 24/7.

GRICUA's restoration philosophy, which aligns with industry best practices, is as follows:

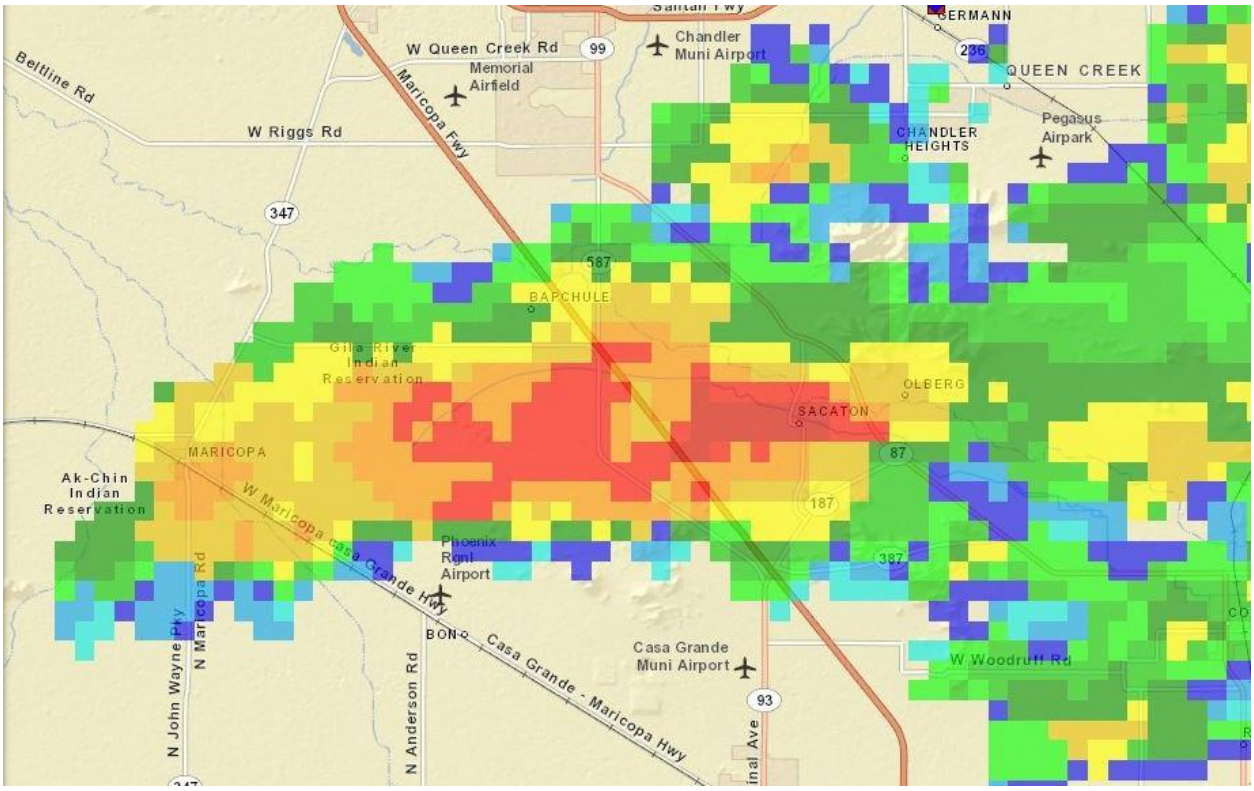
1. Assess, secure and make damaged areas safe for workers, Community members and the general public.
2. Protect undamaged critical infrastructure such as substations.
3. Restore essential services.
4. Restore service to as many customers as possible.
5. Repair infrastructure and restore service to remaining customers.

3. Storm 1 - July 9

At approximately 9:50 PM Storm 1 – July 9, a major monsoon storm, struck the Community from the northeast with microbursts, blowing dust, severe winds, and heavy rains. Storm 1 - July 9 affected Districts 1-4, and the east end of District 5. Screenshot 1 below provides a picture of the weather radar map at 10:00 PM.

Screenshot 1

Screen shot of weather radar 7/9/21 @ 10:00 PM



At 10:00 PM July 9, GRICUA received the first outage call. Crews were dispatched. Within one hour, crews made the assessment that damage was severe and the outages were widespread. The initial GRICUA crew immediately mobilized additional GRICUA

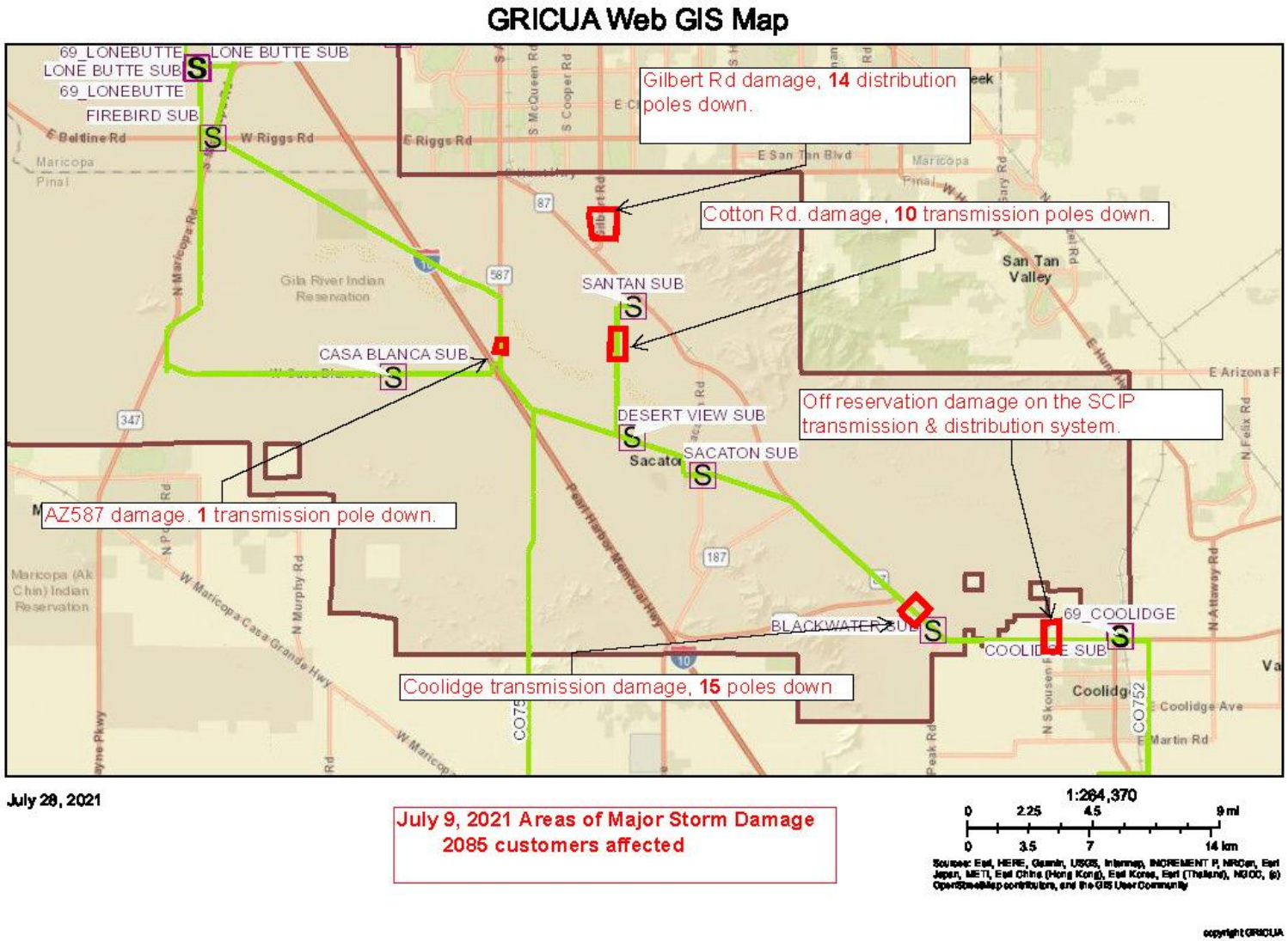
crews as well as two contract crews to make the system safe and start repairs. A discussion of the following topics has been prepared to help understand the scope of the damage and the efforts undertaken to safely restore service.

- 3.1. Areas of Significant Damage
- 3.2. Summary of Storm 1 – July 9 Damage
- 3.3. Storm 1 – July 9 Restoration Activities

3.1. Areas of Significant Damage

Diagram 1 on the next page shows 5 locations of the most severe damage where poles and wires were down. Following Diagram 1 are pictures of some of the damaged infrastructure.

Diagram 1 – Storm 1 – July 9 Areas of Damage



Coolidge 69 kV Damage – 15 poles down

Cotton Road 69 kV Damage – 10 poles down

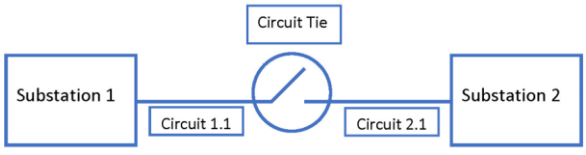
3.2. Summary of Storm 1 - July 9 Damage

- 15 transmission poles with 12kV under-build down on the Coolidge transmission line north of Blackwater Substation along Hwy 87.
- 10 transmission poles with 12kV under-build down along Cotton Rd. on the Santan transmission line, taking the Santan Substation out of service.
- 1 transmission pole with 12kV under-build down on AZ587 on the Casa Blanca transmission line.
- 14 12kV poles down along Gilbert Rd.
- Transmission line with 12kV under-build damage off reservation near Coolidge caused an outage in the Blackwater area of D1.
- Additional, spot damage in Districts 1-5.
- 2,085 customers affected.
- Outage notification provided to Community leaders.

3.3. Storm 1 - July 9 Restoration Activities

- 10:00 PM 7/9/2021 to 3:30 AM 7/10/2021
  - ✓ Within 5 ½ hours, GRICUA completed line repairs, which enabled power to be restored to Desert View Substation, restoring most of Sacaton, the East end of D5 and the southern portion of D4 (1,251 customers restored).
- 3:30 AM to 7:00 AM 7/10/2021
  - ✓ GRICUA crews patrolled and secured system.
  - ✓ GRICUA spoke with OEM about the severity of the damage.
  - ✓ All GRICUA Operations staff were mobilized to system support restoration.
- 7:00 AM to 9:30 AM 7/10/2021
  - ✓ Within 11 ½ hours, power was restored to most of D1 (475 customers restored).
- 7:00 AM to 7:30 PM 7/10/2021
  - ✓ The AZ587 transmission pole was replaced and crews were dispatched to Cotton Rd. to make safe and start the transmission repair.
  - ✓ GRICUA crews and operation staff evaluated spot system damage.
  - ✓ GRICUA engineering staff conducted extensive circuit loading analysis and determined that power could be restored to the remaining D4 customers (564 customers) on a 2-hour alternating rotation. Power would be alternated every 2 hours on the Santan/D4 circuits during peak hours, with full restoration later in the evening.
  - ✓ At approximately 5:00 PM the 1st rotation was implemented east of AZ587.
  - ✓ Within 21 hours, at approximately 7:00 PM GRICUA determined that restoration of service to the customers west of AZ87 could be implemented without the need to disconnect the customers east of AZ87.
  - ✓ The above actions were made possible because of the following implemented by GRICUA since GRICUA assumed operations and maintenance responsibilities for the SCIP system:
    - Planned installation of circuit ties, which are normally open tie points between two circuits as shown on Schematic 1 below.

Schematic 1 Example Of Circuit Tie



- The use of system modeling, SCADA and GIS technology.

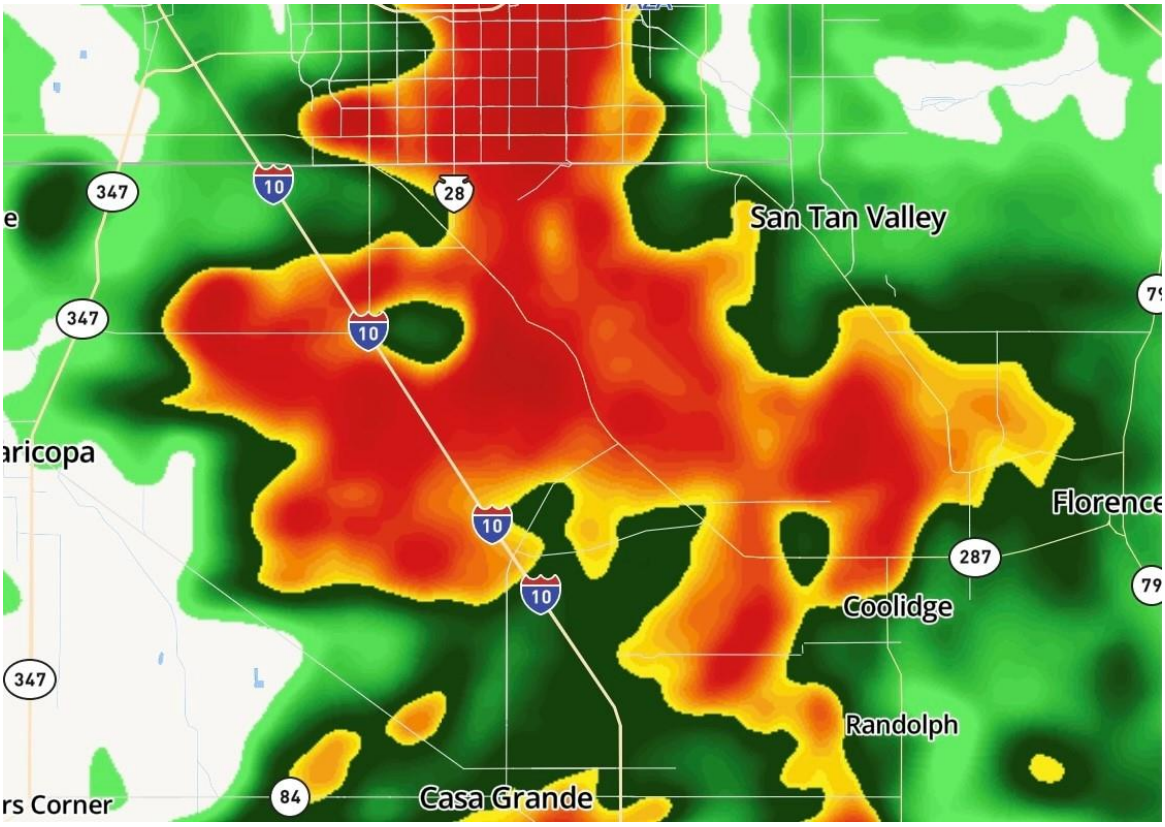
✓ GRICUA still had a significant number of poles that needed to be replaced. The redundancy GRICUA has built into the system enabled GRICUA to restore service to almost 90% of its customers affected by Storm 1 – July 9 at approximately 7:00 PM on July 10th. This was approximately 21 hours after the first outage calls were received. Restoration of the remaining customers continued.

4. Storm 2 - July 10

Less than 1 hour after GRICUA had restored service to 90% of its customers and less than 24 hours since Storm 1 - July 9 had hit the Community, a second major monsoon storm hit the Community. Storm 2 - July 10 was more widespread and more severe than Storm 1 - July 9 and caused additional damage to the GRICUA transmission and distribution systems. 3,425 customers were affected. Screenshot 2 below provides a picture of the weather radar map at 8:00 PM.

Screenshot 2

Screenshot of weather radar @ 7/10/21 8:00 PM



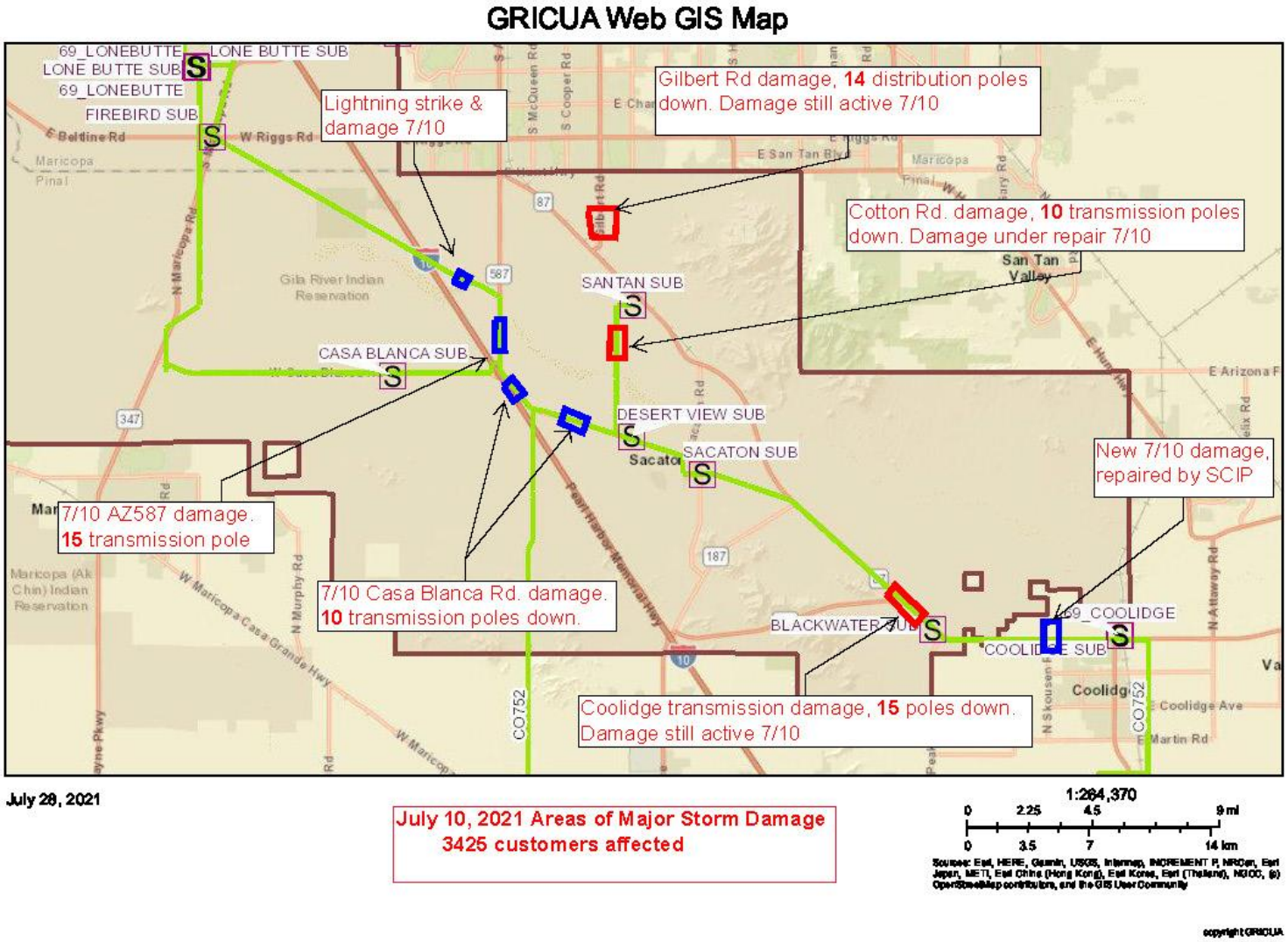
GRICUA crews were in the field at the time of the Storm 2 - July 10 and quickly determined that there was additional widespread damage and outages in Districts 1-5 and parts of District 6. A discussion of the following topics has been prepared to help understand that scope of the damage and the efforts undertaken to restore service safely to those affected areas.

- 4.1. Areas of Significant Damage
- 4.2. Summary of Storm 2 – July 10 Damage
- 4.3. Storm 2 – July 10 Restoration Activities

4.1. Areas of Significant Damage

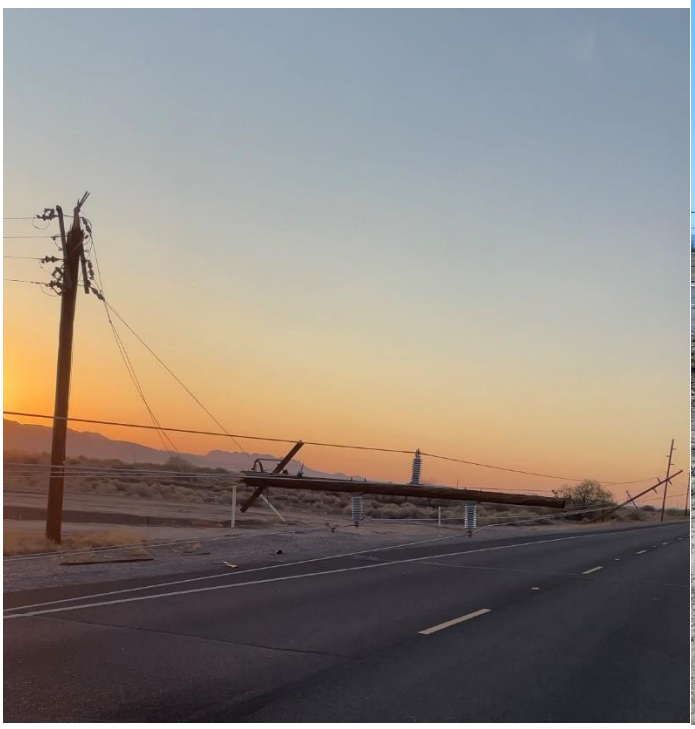
Diagram 2 on the next page shows 4 additional locations of the most severe damage where poles and wires were down in addition to the remaining 3 out of 5 locations from the Storm 1 - July 9. Following Diagram 2 are pictures of some of the damaged infrastructure.

Diagram 2 – Storm 2 – July 10 Areas of Damage



AZ587 Damage

Pole installed in 2020 on Casa Blanca Rd



Casa Blanca Rd

Car trapped on AZ587

Newer pole on AZ587

Wind broke top of pole on AZ587

4.2. Summary of Storm 2 – July 10 Damage

- 15 transmission poles down along SR-587 trapping some Community members in their homes and motorists in their cars.
- Off reservation, damage caused widespread outages in District 1.
- 10 transmission poles with 12 kV under-build were down on the Casa Blanca transmission feed to Desert View and Sacaton Substations. This resulted in extended outages in District 2 & 3 and part of District 4.
- Outage notification is provided to Community leaders.

4.3. Storm 2 - July 10 Restoration Activities

The summary of restoration activities listed below covers the period for 8:00 PM on July 10th through full restoration and all customers back in service on July 16th at 7:30 PM.

- 8:00 PM to 9:30 PM 7/10/2021
  - ✓ Crews in the field joined GRPD to rescue motorists trapped on AZ587 and assist in closing the road.
  - ✓ Within 1 ½ hours power was restored to the Park Substation and customers in the Lone Butte Industrial area (117 customers restored).
- 9:30 PM 7/10/2021 to 1:30 AM 7/11/2021
  - ✓ Within 5 ½ hours power was restored to District 5 customers served from the Casa Blanca and Firebird Substations and District 1 customers served from the Coolidge Substation (1,310 customers restored).

- 1:30 AM to 6:00 AM 7/11/2021
  - ✓ Crews assess damaged areas and make damaged areas safe.
  - ✓ GRICUA requests assistance from two additional contractors to assist in repairs and recovery at heavily damaged locations.
  - ✓ Eight contract crews in addition to the two existing contract crews are assembled and briefed on damage.
  - ✓ Crews are assigned to specific damage areas. Material is assembled and a member of the GRICUA crew is assigned to coordinate repairs at each location.
- 6:00 AM to Midnight 7/11/2021
  - ✓ Five crews are assigned to the top priority Casa Blanca Rd transmission line repair.
  - ✓ Repair is complete at 9:00 PM 7/11/2021.
  - ✓ Within 26 hours power was restored to Desert View and Sacaton Substations (1,251 customers restored). These crews were allowed to rest until 5:00 AM 7/12/2021.
- Midnight to 6:30 AM 7/12/2021
  - ✓ Switching and minor distribution repairs are complete.
  - ✓ Within 34½ hours power was restored to all customers, except those in spot damaged areas (564 customers restored).

As of July 12th at 6:30 AM, GRICUA had restored service to all customers except customers in spot damaged areas. This restoration was completed within 35 hours of Storm 2 – July 10 hitting the Community. GRICUA was able to accomplish this through the restoration efforts of GRICUA and 3rd party contract crews as well as through the ability to utilize circuit ties to reconfigure the system. For the next 4 days, GRICUA and 3rd party contract crews rebuilt the damaged system and restored service to spot damaged areas as summarized below.

- 6:30 AM 7/12/2021 thru 4:00 PM 7/16/2021
  - ✓ Three crews are dispatched to resume the Cotton Rd. transmission repair. The repair was completed at 10:00 PM 7/12/2021.
  - ✓ Santan Substation energized 7/13/2021 9:15 AM.
  - ✓ Santan circuits were returned to normal operating conditions.
  - ✓ Cotton Rd. residents were allowed to return home on 7/13/2021 in the evening.
  - ✓ Four crews were dispatched to the AZ587 transmission repair.
    - More crews were added as they became available.
    - Sections of line were energized as they were repaired and the road was opened 7/15/2021.

- Customers were allowed to return to their homes & businesses the morning of 7/16/2021.

✓ Four crews are dispatched to the Highway 87 Coolidge transmission repair.

- This circuit was assigned a lesser priority as it is a backup circuit in emergency conditions.
- The broken and damaged poles were removed on 7/13/2021.

✓ The line was repaired and returned to normal operating conditions on 7/16/2021. All spot outage locations (approx. 30) were repaired and returned to service on 7/15/2021.

GRICUA released 7 of the contract crews on the afternoon of 7/16/2021, while retaining 3 contract crews to assist with completion of the repair of the system.

All clean-up work was completed by July 23, 2021.

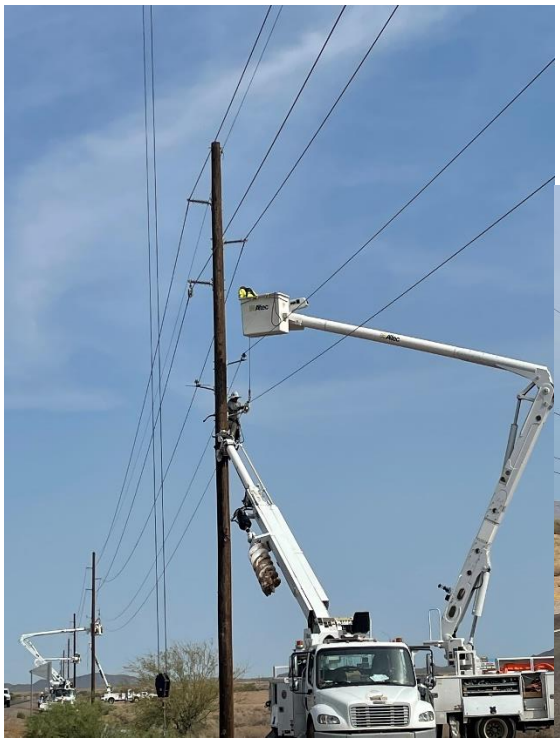
5. Summary Of Storm 1 - July 9 and Storm 2 - July 10

Ten contract crews from three electric utility contractors responded to GRICUA's call for storm restoration assistance. These crews were comprised of 70 qualified line-workers and over 85 pieces of equipment. GRICUA's eight qualified line workers provided safety leadership, technical support, project management and switching coordination. GRICUA's operations staff provided material, engineering support, line patrol, system condition assessment and Community communications.

GRICUA provided approximately 900 meals to line-workers and support staff.

The estimated cost of the restoration is $1.5 million.

Below are pictures of the crews repairing damaged infrastructure.




Rebuilding on Casa Blanca Rd.


Re-setting poles on AZ587

6. Frequently Asked Questions

6.1. Who owns the On-Reservation power system infrastructure?

SCIP owns a majority of the On-Reservation infrastructure, while GRICUA owns what it has added to serve new customers. The Community and GRICUA have a PL-638 contract to operate and maintain the SCIP On-Reservation power system infrastructure. SCIP provides funding for basic O&M and under the terms of the contract is required to provide additional funding to keep the system in safe operating condition and provide an acceptable level of service. The table on the next page reflects the projects planned and the funds spent by GRICUA for transmission maintenance and improvements since 2009. Note that this does not include the funds for the planned distribution circuit tie projects that enabled GRICUA to restore power even with some of the 69 kV lines down.

Table of Transmission Improvements

Transmission Improvements	Year	Project Cost	Comments
	2009	$0	no operations & maintenance responsibilities
	2010	$150,000	budgeted & spent on transmission line inspection & repairs
	2011	$150,000	budgeted & spent on transmission line inspection & repairs
	2012	$250,000	budgeted & spent on transmission line inspection & repairs
	2013	$250,000	budgeted & spent on transmission line inspection & repairs
	2014	$250,000	budgeted & spent on transmission line inspection & repairs
	2015	$250,000	budgeted & spent on transmission line inspection & repairs
Gasline 3-way Switch Upgrade	2015	$198,000	replaced aging & dangerous equipment
	2016	$250,000	budgeted & spent on transmission line inspection & repairs
Firebird Viper switch installation	2016	$250,000	split single circuit into 2 circuits
	2017	$275,000	budgeted & spent on transmission line inspection & repairs
Lone Butte transmission 152 relay equipment upgrade	2017	$175,000	replaced aging transformer & updated substation relay system
	2018	$275,000	budgeted & spent on transmission line inspection & repairs
69KV switch replacements with LB switches	2018	$110,000	replaces aging & failing equipment
Casa Blanca Rd Transmission Project	2018	$5,000,000	provides transmission redundancy to District 5, replaces aging transmission line
	2019	$275,000	budgeted & spent on transmission line inspection & repairs
	2019	$200,000	storm repairs & transmission hardening
	2020	$275,000	budgeted & spent on transmission line inspection & repairs
	2020	$200,000	storm repairs & transmission hardening
	2021	$275,000	budgeted transmission line inspection & repairs (amount is estimated)
	2021	$2,000,000	estimated for storm repairs & transmission hardening (amount is estimated)
Total Transmission Improvements		**$11,058,000**	

6.2. Does GRICUA have a maintenance program?

Yes, GRICUA has a formal maintenance program. An annual report is prepared and presented to the GRICUA Board of Directors. The 2020 System Maintenance & Reliability Report is available as Appendix A.

6.3. How old are the transmission poles? Are they tested and maintained per electric utility standards?

The table below identifies the number, ownership and age of the transmission poles in our system.

Table of GRICUA/SCIP Transmission Field Inventory

GRICUA/SCIP Transmission Field Inventory								
Owner	total number	number of steel	number of wood	wood 0-10 yrs old	wood 11-20 yrs old	wood Over 20 yrs	Percent inspected since 2010	Notes
SCIP	1076	21	1055	375	355*	345*	100%	testing per UMMS 10 yr cycle
GRICUA	69	14	55	55				testing starts year 11
WAPA/GRICUA	62	62						steel mono pole, WAPA ownes & maintains
* install dates are not available								

The poles are tested and maintained per electric utility standards.

6.4. Were the poles that broke due to Storm 1 - July 9 and Storm 2 - July 10 old?

Transmission poles have a life expectancy of up to 60 years. Some of the poles that were broken during the storm were in the 20 – 30 year range and some had been installed in the last 12 to 36 months. The GRICUA crews that were supervising the restoration noted that the majority of the damaged poles were in acceptable condition. However, they did notice that there were several poles that had termites. In addition, they also reported that most of the poles broke 10 to 15 feet above the ground, which indicates that the bases of the poles were solid and that high winds caused initial damage.

6.5. Why doesn't GRICUA install steel poles or convert the transmission system to underground?

Both GRICUA and SCIP have steel poles strategically installed in critical transmission locations. As GRICUA plans projects to upgrade and expand the transmission and distribution system, the use of steel poles is evaluated based upon cost and need. The 69 kV transmission wood pole standard and designs used by both GRICUA and SCIP were professionally prepared by consulting engineering firms. Steel poles are approximately twice the cost of equivalent wood poles and require special equipment to install. The wood poles that are installed today have a life expectancy up to 60 years with proper maintenance and treatment.

Overhead 69kV transmission construction is still the most recognized industry standard used to serve both rural and suburban areas. Underground 69kV installations are typically used where space or safety conditions dictate. Converting overhead transmission to underground is extremely expensive. GRICUA's estimated cost for overhead 69kV transmission construction is $400,000 per mile. The estimated cost of underground construction is six times the cost of overhead or $2,400,000 per mile. To convert all 70 miles of SCIP and GRICUA On-Reservation overhead transmission lines would cost approximately $168,000,000.

6.6. Was the repair work done to GRICUA standards?

Yes, all materials and work quality met the same specifications and standards as required for all of its projects. GRICUA crews supervised contractors to make sure that both safety and standards were met. All of the material used in the restoration process was GRICUA approved material and came directly from our inventory or vendors that provide material per the GRICUA material specifications. The repairs included "Stopper Pole" installation every 4th pole.

6.7. Does GRICUA plan to change their maintenance and inspection process following the storm?

Yes, GRICUA plans to enhance its pole testing. In addition to testing by GRICUA's crews, GRICUA will retain the services of an independent 3rd party pole testing and treatment company. Funds for this enhanced program will be included in GRICUA's FY2022 budget.

GRICUA also intends to develop a program to utilize the practice of installing transmission "Stopper Poles". This program will result in the evaluation and implementation of inserting higher strength poles in the line. This will strengthen the transmission system against cascading pole failures during severe wind conditions.

6.8. Since 2010, what reliability and redundancy improvements has GRICUA made to the 69 kV and 12 kV systems? What are some of GRICUA's future plans to enhance reliability and redundancy?

Since 2010, GRICUA has overseen the replacement of 4 69 kV to 12 kV transformers, installed 2 new 69 kV to 12 kV substations, installed 18 miles of new 69 kV transmission lines and upgraded 10 miles of existing 69 kV transmission lines. Appendix B provides diagrams showing the past, current and future stages of the 69 kV transmission system. Appendix B – Diagram A shows the 69 kV system in 2010. Appendix B – Diagram B shows the 69 kV system in 2021. Finally, Appendix B – Diagram C shows the future 69 kV system. The most significant addition was the 69 kV transmission loop from Lone Butte Substation to Casa Blanca Rd Substation, which added redundancy to the system.

With respect to the 12 kV system, also known as the distribution system, GRICUA has upgraded portions of the distribution system as well as adding 14 circuit ties to improve reliability. Circuit ties allow for some portion of the load on the circuit that has failed to be transferred to the backup circuit to restore service quicker. Appendix B – Diagram D shows the 12 kV system and the circuit ties that have been added since 2010 as well as those planned for the near future.

7. Conclusion

Storm 1 - July 9 and Storm 2 - July 10 did major damage to the 69 kV transmission infrastructure. GRICUA was able to respond to Storm 1 - July 9 and restore the majority of service within 22 hours. This was achieved by prioritizing crews to make only essential repairs and using circuit ties to restore service by switching around areas where restoration of infrastructure would have taken significantly longer to accomplish. Over the past 10 plus years, GRICUA has planned for single contingency events by making improvements to the transmission and distribution infrastructure, including redundant circuits and circuit ties. For the magnitude and severity of Storm 1 - July 9, the system was resilient enough to allow GRICUA crews to restore service quickly considering the significant damage incurred.

Just when GRICUA had succeeded in restoring service, Storm 2 - July 10 hit. This second contingency resulted in additional significant damage to the infrastructure. GRICUA's options to restore service at this time were limited. GRICUA prioritized the work and focused on the locations where repairing the damaged infrastructure would result in the most customers having their service restored and in the shortest amount of time. By July 12, 2021, at approximately 6:30 AM, only 35 hours after Storm 2 – July 10 hit, GRICUA had restored service to the majority of customers except for those with spot damage.

GRICUA crews and staff responded quickly and effectively to address the destructive back-to-back storms and microbursts. GRICUA rapidly and continually assessed the situation and brought in additional resources as needed. All of the work was completed safely and professionally.

Appendix A - System Maintenance & Reliability Report

1. Background

In 2013, the Gila River Indian Community Utility Authority (GRICUA) developed the System Maintenance Strategy Project (SMSP) to identify maintenance strategies and practices commonly used in the electric utility industry. The SMSP also made recommendations on how GRICUA could use these practices to improve their existing maintenance program. The 2013 report included recommendations to implement a maintenance software package, budget staff resources for more comprehensive inspections and prioritize SCIP 69kV transmission system inspections.

The 2014 SMSP provided further evaluation of GRICUA's system maintenance strategies, maintenance practices and implementation of the Utility Material Maintenance System (UMMS) software. In 2015, SMSP was fully functional using the UMMS software and the implementation of a 2-man service crew dedicated to substation maintenance, system inspection and minor system repairs associated with inspection findings. The 2015 SMSP made recommendations to continue evaluation and improvement of the UMMS software, budget time and resources to complete inspections and the associated repairs, continue to monitor the condition of the SCIP 69kV transmission system and continue use of the American Public Power Association (APPA) eReliability software.

The 2016 SMSP recommended continued use of the UMMS software to document the system maintenance and repair effort and implementation of a more aggressive bird guard program. The 2017 SMSP recommended evaluation of the UMMS software and schedule, exploration of an interface between UMMS and the GIS software and continuation of the established maintenance program.

The 2018 SMSP recommended continued evaluation and improvement of the UMMS software, as well as implementation of a system modeling software, Milsoft, that would provide engineering analysis and GIS interface for detailed system planning and system load evaluation and more in-depth monitoring and documentation of the SCIP 69kV transmission system condition. The 2019 SMSP recommended continued evaluation and improvement of the UMMS software and further integration with GIS and full implementation of the Milsoft system modeling software. It also recommended incorporation of aerial assessment into the SCIP 69kV transmission inspection process and research into new bird guard options.

The evaluation of the maintenance schedule determined that the schedule still exceeds industry best practices for utility industry and it was not changed. Appendix A is the approved SCIP/GRICUA Maintenance Schedule.

In 2013, GRICUA also developed the Reliability Measurement Plan (RMP) to identify reliability indices used in the electric utility industry, and recommend reliability indices for use by GRICUA. The RMP also established a system for recording and analyzing GRICUA outage data, for comparing data to industry standards and for understanding and improving GRICUA's electric system to help control outages. GRICUA has

established a relationship with APPA and participates in the APPA eReliability program where GRICUA reliability data is compared to data provided from similar size electric utilities and utilities in our geographic region. In 2019, GRICUA ranked in the top quartile (25%) of APPA utilities for System Average Interruption Duration Index (SAIDI) based on the APPA eReliability data.

2. Objective

The objective of the 2020 System Maintenance and Reliability Strategy Report is to provide a summary of SMSP results and RMP data for 2019, make some observations about the relationship of the two programs and provide 2019 GRICUA reliability data compared to the national APPA data.

3. Discussion of SMSP Results

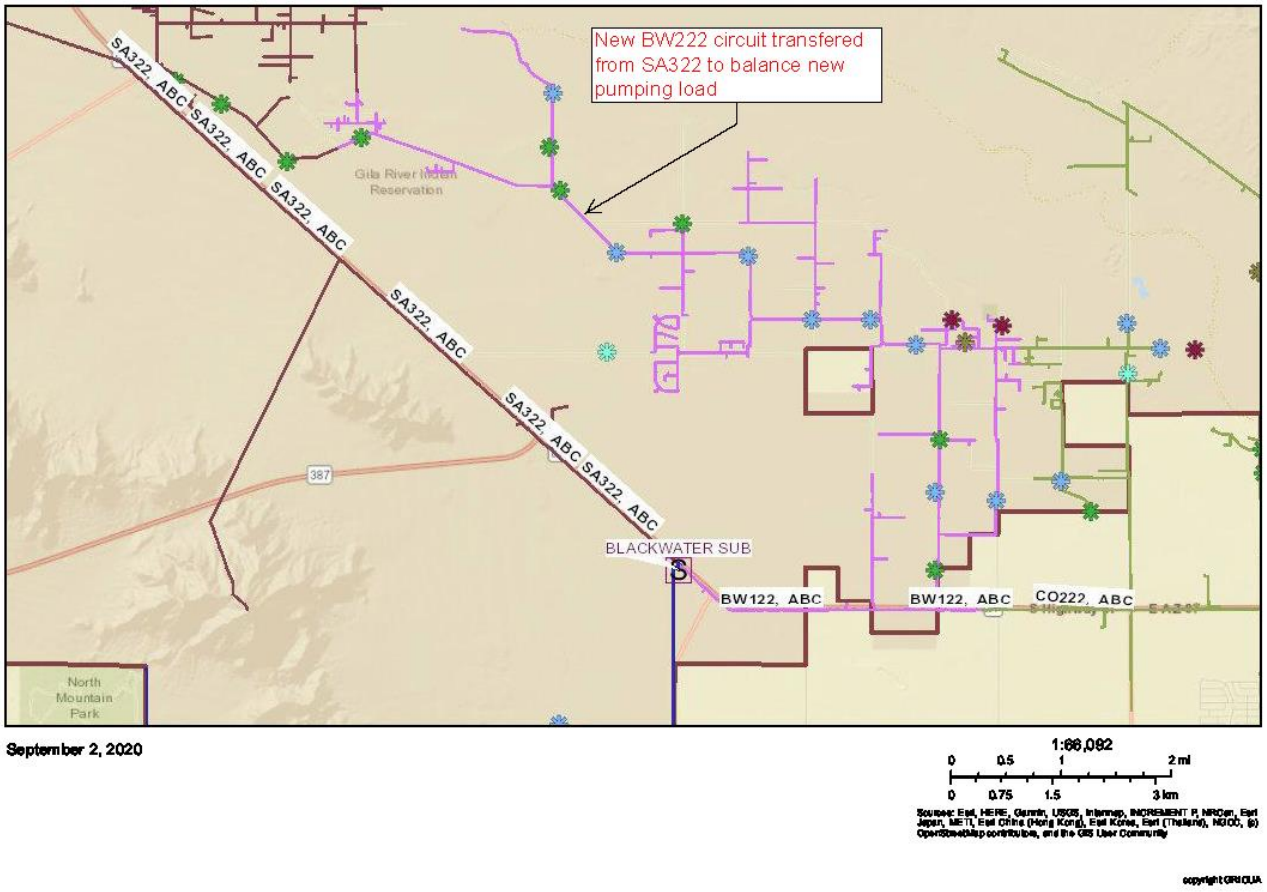
GRICUA provides operation and maintenance of the on-Reservation SCIP facilities in addition to the GRICUA owned infrastructure. The combined system is comprised of ten distribution substations, more than 480 miles of overhead and underground lines, 10,200 poles and 2,800 control devices providing electric service to our customers' homes, businesses and Community government facilities. The SMSP is comprised of four (4) inspection activities. The processes and 2019 outcome are briefly discussed below.

- GRICUA administers a comprehensive tree management program utilizing industry best practices. The program includes pruning and removal of trees that pose a threat to transmission and distribution lines. It also includes hazard tree assessment and the use of a form to identify trim locations that are found during routine line inspections. Data on problem areas and the trim schedule is maintained in the GIS system, allowing the ability to maintain an efficient inspection and trim schedule. The outcome of this aggressive tree trimming program has allowed GRICUA to implement a two-year trim schedule resulting in reduced maintenance costs related to tree trimming. The effect of this process has been no controllable tree related outages in the last seven years.

- The structured system line patrol includes visual inspection of line condition and the condition of the associated poles, cross arms and hardware. The 2019 inspection and circuit loading evaluation process helped identify circuits that are subject to voltage drop during high demand summer months. The inspection report and evaluation were used to justify the installation of capacitor banks in 2019 to improve line voltage. There have been no broken line outages that were unrelated to major storms since 2013, but inspections did identify areas of concern that were scheduled for line upgrade work in 2020. One of those concerns was voltage drop on the SA322 circuit cause by the installation of GRIIDD irrigation facilities. The Blackwater substation upgrade and addition of the BW222 circuit was the result of this evaluation. GRICUA

also evaluates line fuse sizing following outages related to blown line fuses. Fuse information is entered into the GIS data and used to evaluate coordination to better protect the distribution system. See BW222 circuit map below.

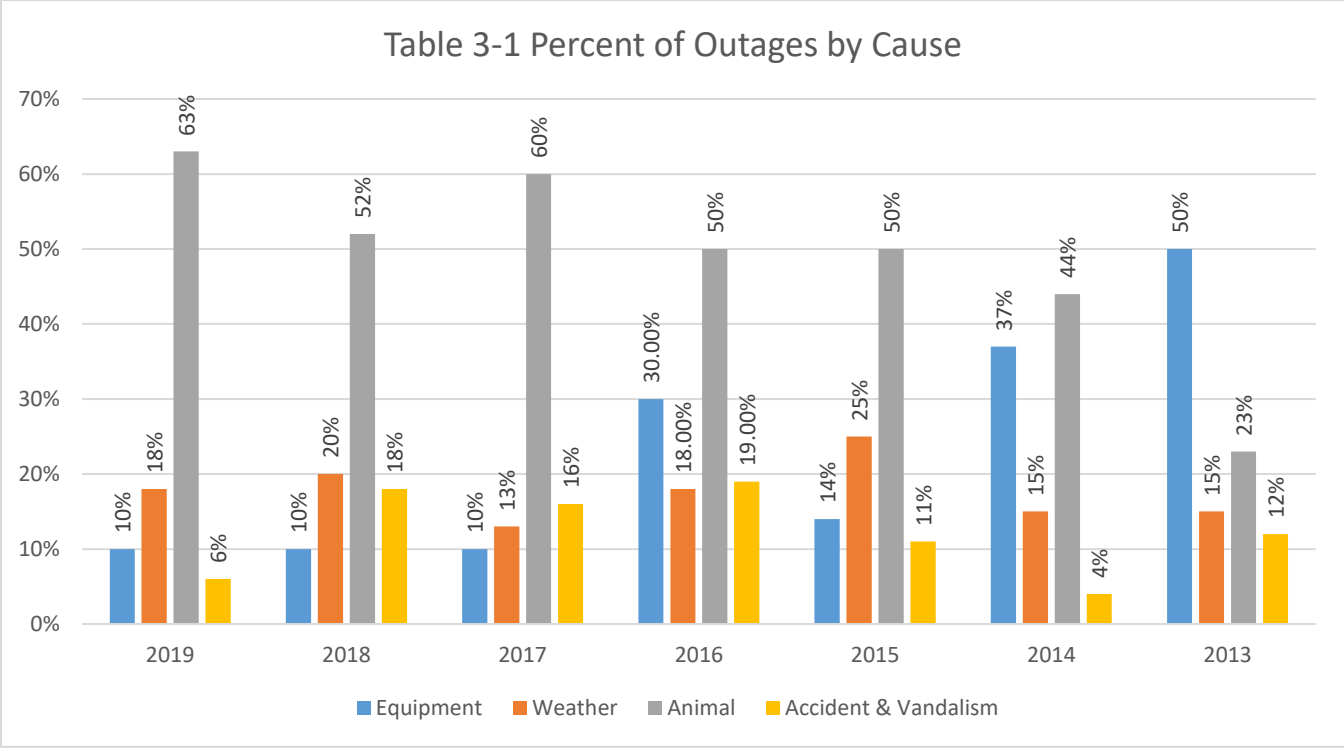
BW222 Circuit Map



- The comprehensive equipment inspection process, with documentation to assure that all equipment is inspected per the SMSP, was completed. Overhead and underground line devices, which includes switches, capacitors, reclosers, voltage regulators and controls are removed from service and maintained on a fixed periodic basis. Transformers and termination devices are subject to infrared (IR) termination evaluation in addition to the inspection and repair process. These devices are not typically removed from service during the inspection process. The number of equipment related outages in 2019 was less as in 2018 reflecting a 12% reduction in the number of customers affected by equipment related outages in 2019. The 2019 inspection process also resulted in the replacement of several leaking transformers and damaged and aging pad mounted equipment.

- Each substation is inspected twelve times per year. Substation transformer oil is tested quarterly and units that show signs of excessive wear are tested more often. A baseline IR scan has been recorded for each substation. Subsequent IR scans are used to identify potential areas of concern. The IR inspections helped identify conditions at the Park and Firebird stations that would have eventually resulted in widespread outages had they gone undetected. SCIP station relay function and settings have also been evaluated and updated. In addition to improving station reliability, this inspection and testing process was helpful in obtaining SCIP funding for the new Desert View substation. The 2019 substation inspections identified the need to further evaluate the condition of the aging substation breakers and improvements to the grounding grid in existing SCIP substations. The inspection process was also instrumental in escalating the need for Supervisory Control and Data Acquisition (SCADA) in all substation. A recommendation for implementation of SCADA along with of a more rigorous maintenance and replacement schedule were evaluated in 2019. There were no substation transformer failures in 2019 and un-necessary relay trips were eliminated in 2019.

Table 3-1 illustrates outages causes in 2013 thru 2019. Equipment related outages decreased measurably in 2017 and 2018. Animal related outages decreased in 2018 following a more aggressive avian protecting effort. The GRICUA purchasing and technical staff continues to research and identified new products developed to prevent birds from contacting energized line components and incorporate approved products into the GRICUA inventory.



4. Discussion of RMP Data

The objective of the Reliability Measurement Plan (RMP) was to identify reliability indices used in the electric utility industry. GRICUA uses the following indices to evaluate system reliability:

ASAI – Average System Availability Index. ASAI is a measure of the overall reliability of the system. It represents the percent of time during the year that the average customer has power.

SAIDI – System Average Interruption Duration Index. SAIDI is a measure of duration. It measures the number of minutes over the year that the average customer is without power.

SAIFI – System Average Interruption Frequency Index. SAIFI is a measure of the number of times the average customer experiences a power outage.

CAIDI – Customer Average Interruption Duration Index. CAIDI is a measure of duration that provides the average amount of time that a customer is without power per outage.

The RMP also established guidelines for recording “controllable” and “un-controllable” outages as well as a “Major Event” definition. Major events are removed to normalize information to ensure that participating utilities are recording real changes in reliability indices. The outage indices provided at each monthly GRICUA Board meeting is calculated using “controllable” outage criteria. For the purpose of comparing GRICUA data to APPA data, GRICUA reported data that aligned with the APPA requirements. Table 4-1 illustrates the differences in the reporting criteria.

Table 4-1

GRICUA Reporting Criteria

Outage Cause	Recommendation	Justification
Accident, Animal & Vandalism	**Exclude**	**Project goal is to record "controllable" outages, these causes are not "controllable"**
Equipment Failure	**Include**	
Storm, Minor	**Include**	**system should be able to sustain normal storm conditions**
Storm, Major	**Exclude**	***Wind speed that exceeds 60 MPH**
		***Lightning intensity that exceeds Vaisala[1] average flash Density of 3 to 4 fl/(km²-yr)**
		(8/14/12 storm had 4 flashes per sq. km in a 2.5 hr time frame)

[1] Vaisala is an international environmental monitoring company that provided geographic lightning data.

APPA Reporting Criteria

Outage Cause	Recommendation	Justification
Accident & Vandalism	**Include**	
Animal	**Include**	**are controllable to some extent and are included in APPA data**
Equipment Failure	**Include**	
Storm, Minor	**Include**	**system should be able to sustain normal storm conditions**
Storm, Major	**Exclude**	**An event that represents an interruption or group of interruptions caused by conditions that exceed the design or operational limits of the system**

Per the RMP recommendations, GRICUA maintains a relationship with the American Public Power Association (APPA) and participates in the APPA eReliability program where GRICUA reliability data is compared to data provided from similar size electric utilities and utilities in our geographic region. GRICUA data was included in the APPA 2013, 2014, 2015, 2016, 2017, 2018 and 2019 eReliability reports. **Appendix B** is a summary of the 2013 thru 2019 GRICUA reliability data that demonstrates improved statics. **Appendices C – I provide a summary of GRICUA compared to APPA reliability data for the years 2019 – 2013 respectively.**

5. Observations

The general observation is that reliability on the SCIP/GRICUA system has improved noticeability since GRICUA assumed responsibility for operations and maintenance, but data to measure improvement had not been fully documented prior to 2012. Outage data was recorded starting in FY2009 but was not used to generate statistics to support the improvement until FY2012. GRICUA started calculating industry recognized reliability indices in January 2013. It should be noted that accident, vandalism and animal as well as major storm related outage are largely uncontrollable. Improvements in these categories indicate that the system is stronger and better able to withstand uncontrollable elements. The equipment category is more indicative of overall system condition. Data indicates that in 2019, equipment related outage hours were approximately 85% less than in those reported in 2013.

Outage statistics are also used to identify chronic problems in specific areas of circuits. A reduction in the number of chronic system problems may be more indicative of the success than outage statistics. Chronic system deterioration develops slowly over time. Symptoms may be continual or intermittent, but eventually leads to system failure and long power outages. GRICUA has used system inspection findings to identify sections of circuit mainline that indicate age related deterioration. Pole replacement work on the Lone Butte overhead feeder circuits, the upgrade of pad mounted switched in the Wild Horse Pass Development Area and the 69kV breaker replacement project at Lone Butte

substation are examples of GRICUA's pro-active assessment and maintenance program in 2019.

Evaluation of the SCIP transmission, substations and station relay assessments are another example of efforts that have led to improved system performance and the eventual replacement of aging SCIP equipment. Funding for the addition of a new breaker bay at the Lone Butte substation and a reconductor project between Desert View and Santan substations was approved because of conditions identified in maintenance reports.

Further evaluation of the age of both SCIP and GRICUA substations indicate that to maintain substation integrity, a more rigorous maintenance program is needed for substation transformers and regulator banks. Recommendations for FY2021 will include a systematic plan for in-depth substation testing and evaluation as well has implementation of industry standard regulator maintenance.

6. Recommendation

GRICUA recommends the following:

A. Continue to evaluate and improve the existing system maintenance plan including the Utility Material Maintenance System (UMMS) software. Further develop integration with GIS and Milsoft.

B. Complete full implementation of the Milsoft system modeling software that will provide engineering analysis and GIS interface for detailed system planning and system load evaluation.

C. Implementation of an in-depth substation transformer maintenance program. This will involve taking equipment out of service to evaluate the condition of internal components and making necessary repairs. **Appendix J** is the FY2021 Substation Transformer Maintenance Schedule.

D. Implementation of an in-depth regulator maintenance and reconditioning program. This requires the purchase of backup regulators. New regulators will be installed at the scheduled locations and removed regulators will be reconditioned and returned to service where needed.

E. Continue to budget the crew time and resources required to complete the inspection requirements, the associated repairs and the tree trimming effort.

F. Continue to monitor and document the condition of the SCIP 69kV transmission system. This includes the recommended comprehensive pole inspection process, Infra-Red (IR) scans and aerial inspection of lines, cross-arms and conductor. Continue aerial inspections with Unmanned Arial Systems (UAS).

G. Maintain the current aggressive bird guard program and continue to research new bird guard options.

H. Continue the affiliation with APPA and use of the eReliability software.

APPENDIX A

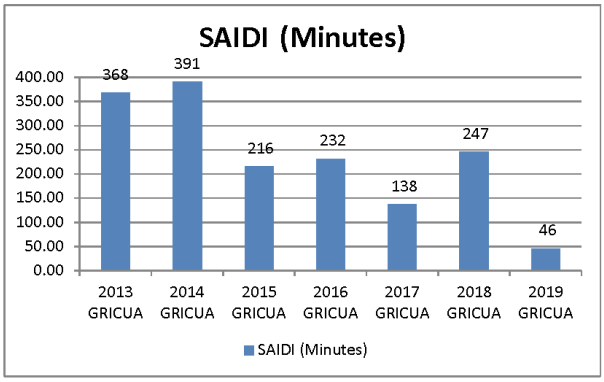
ITEM	Schedule		COUNT		SCOPE	NOTES
DISTRIBUTION	SCIP	GRICUA	SCIP	GRICUA		
OH Line Inspection*	Annual	Annual	320 miles	30 miles	Vehicle patrol assigned circuit. Notes condition of sag, xarms, braces, insulators, down guys, grounding & trees. Record & prioritize needed repairs.	(crew & designers) All lines affected by weather related outages are patrolled for damage following restoration.
12 kV Pole Inspection*	10 years	10 years	9041	1133	Drive/foot patrol "sound & bore". Note condition of suspect pole for further evaluation.	(crew & designers) Implement 10% per year inspection cycle
OH Transformer Inspection*	10 years	10 years	1Ø-1679 3Ø-431	1Ø-310 3Ø-6	Observe xfmer condition, connections & labeling during pole inspection. Note conditions for further evaluation. Install bird guard.	Recommend jumper & service conductor upgrade if sub-standard. Bucket top inspection when performing routine work. (crew) Implement 10% per year inspection cycle
Pad Transformer Inspection*	5 years	5 years	1Ø-169 3Ø-130	1Ø -50 3Ø-77	Note connection, labeling, cabinet & pad condition and rodent damage. IR scan	(crew)
OH Switch Inspections*	Annual	Annual	277	42	Test Functionality. Lube & exercise switches. IR scan	(crew) do not test radial SCIP equip. without authorization
UG Switch Inspections*	Annual	Annual	38	90	Test Functionality. Lube & exercise switches. IR scan	(crew) do not test radial equip. without authorization
Regulator Bank Inspection*	Annual		2		Test Functionality. Lube & exercise switches. IR scan	(crew)
Recloser Inspection*	Annual		1 (not in service)		Test Functionality. Lube & exercise switches. IR scan	(crew)
UG Feeder terminations (manhole)*	5 years	5 years	48		Visual for water & rodents, IR scan terminations	(crew)
Tree Trimming	Annual	Annual			Drive all OH circuits & prepare "trim" map	Review locations w/crew foreman (Designers)
* Meets Industry Standands						
** Exceeds Industry Standands						

APPENDIX A Continued…

ITEM	Schedule		COUNT		SCOPE	NOTES
TRANSMISSION	SCIP	GRICUA	SCIP	GRICUA		
69kV transmission line system*	Annual	Annual	65 miles 22 switches	5 miles	Vehicle patrol assigned circuit. Notes condition of sag, xarms, braces, insulators, grounding, down guys & trees. Use binoculars for connection & switch inspection. Verify label condition. IR scan. Record & prioritize needed repairs.	All lines effected by weather related outages are patrolled for damage following restoration. Bucket top inspection with performing routine work. (crew)
69kV transmission pole**	10 years	10 years	1055 wood	55 wood	New pole start inspection cycle year 11. Drive/foot patrol assigned circuit. "Sound & bore" pole inspection. Record & prioritize needed repairs.	All lines effected by weather related outages are patrolled for damage following restoration. Bucket top inspection with performing routine work. (crew)
SUBSTATION Inspections per 638 spec.	SCIP	GRICUA	SCIP	GRICUA		
Substation site inspection*	monthly	monthly	6	2	Check fence condition & grounding, vandal damage	(crew)
Substation reads*	monthly	monthly	8	2	Amp reads, battery status, nitrogen, temperature & fire extinguisher	(crew)
Substation breakers**		bi-annual		2	Visual on SCIP, operation requires authorization from SCIP, exercise GRICUA	(crew)
IR Scan*	Annual	Annual	6	2	Compare to baseline	(crew)
Transformer oil evaluation**	quarterly	bi-annual	8	3	Submit to lab for evaluation, forward results to SCIP	(crew)
Transformer LTC**	quarterly		2	2	Record changes, verify gauges are working	(crew)
Transformer LTC oil evaluation**	5 years		2	2	Submit to lab for evaluation, forward results to SCIP	(crew)
MAINTENANCE DOCUMENTATION	SCIP	GRICUA	SCIP	GRICUA		
Records Management**	monthly	monthly			System condition report (SCR)generated SCIP notification. UMMS for GRICUA notification & scheduling	(crew & Operations Director)
* Meets Industry Standands						
** Exceeds Industry Standands						

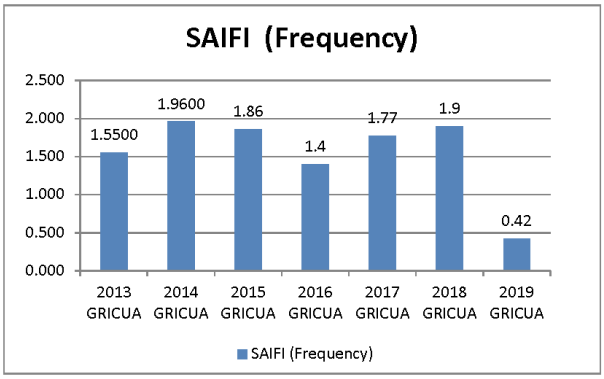
APPENDIX B

2013-2019 GRICUA Reliability Indices Trends



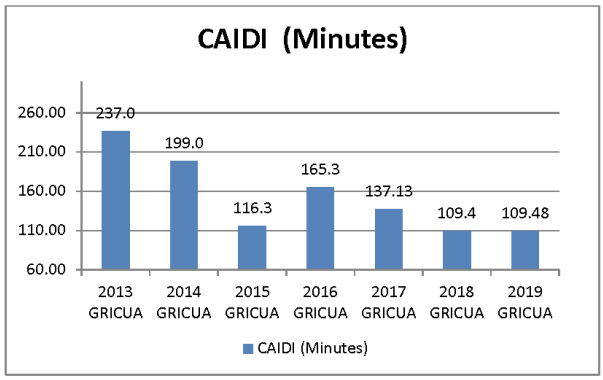
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



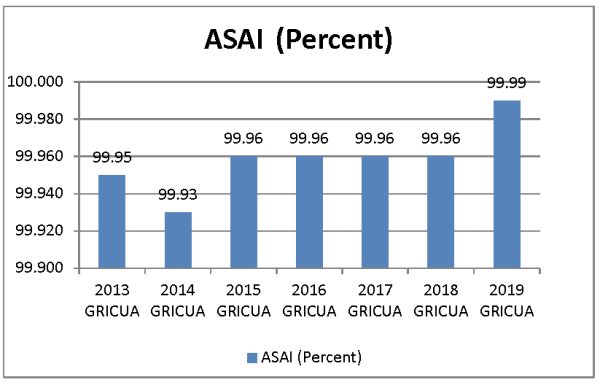
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for <u>only</u> those customers that experienced an outage.



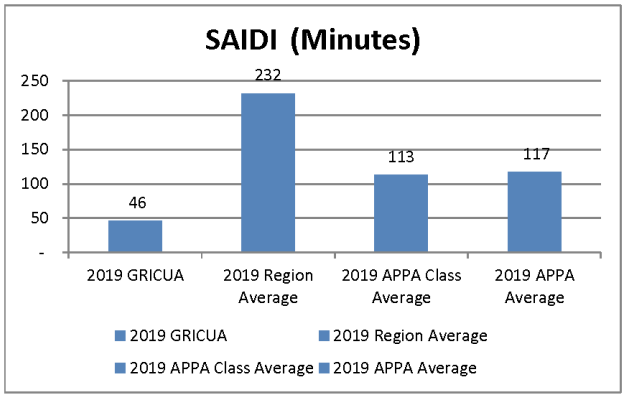
ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

ALL outages are recorded for this data

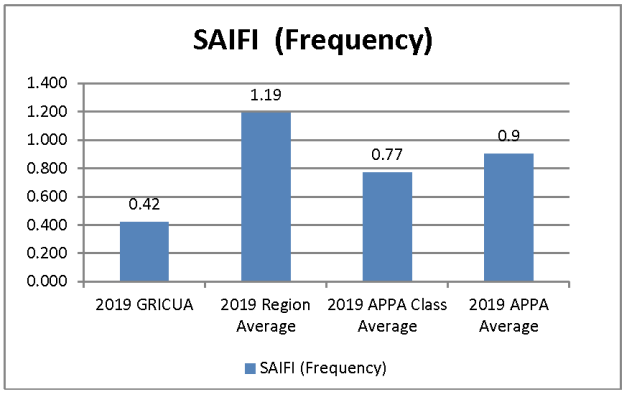
APPENDIX C

2019 GRICUA Reliability Indices Compared to APPA Data



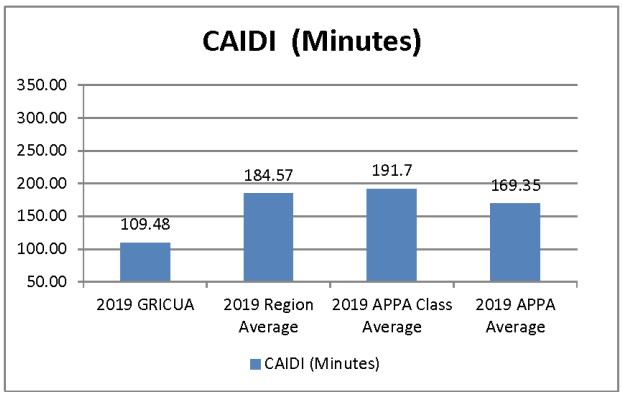
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



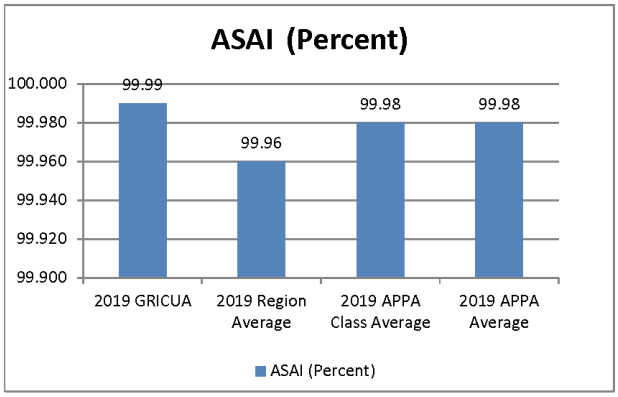
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for only those customers that experienced an outage.

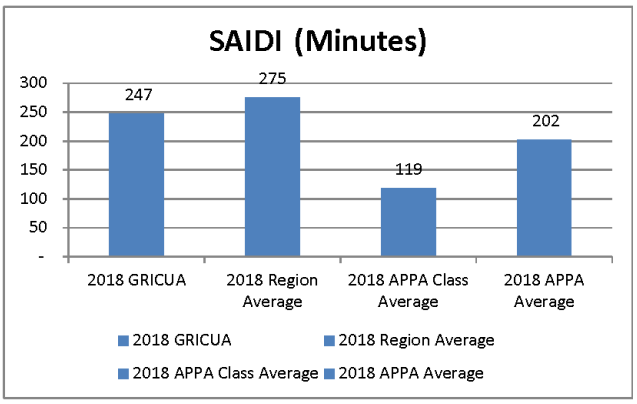


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

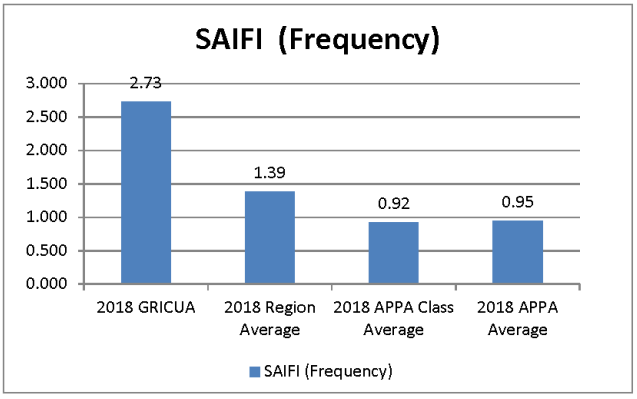
APPENDIX D

2018 GRICUA Reliability Indices Compared to APPA Data



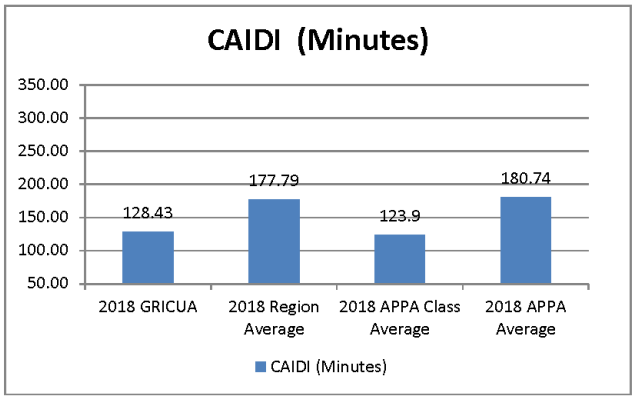
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



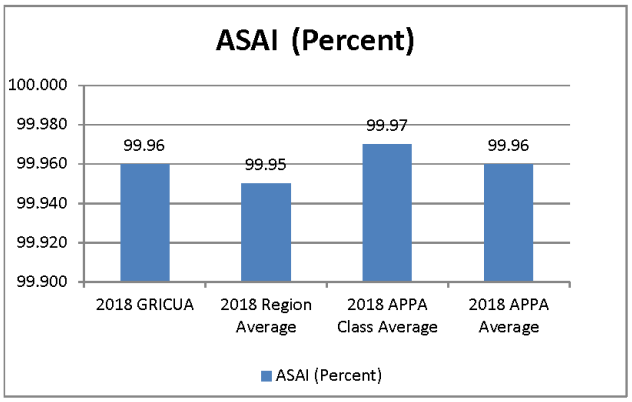
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for <u>only</u> those customers that experienced an outage.

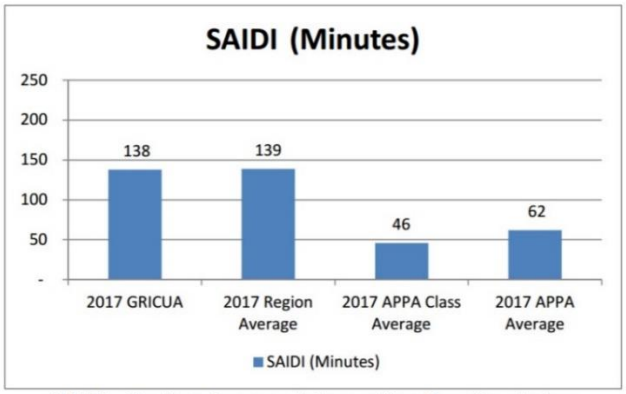


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

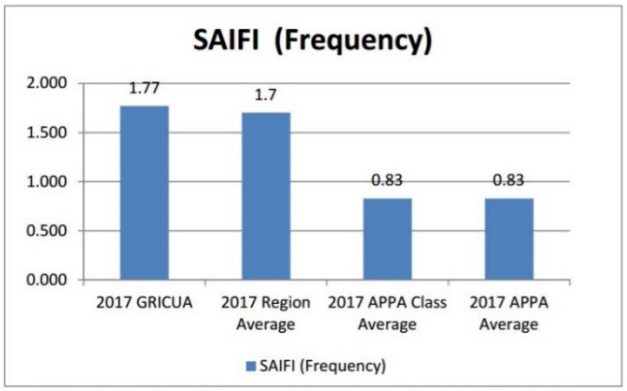
APPENDIX E

2017 GRICUA Reliability Indices Compared to APPA Data



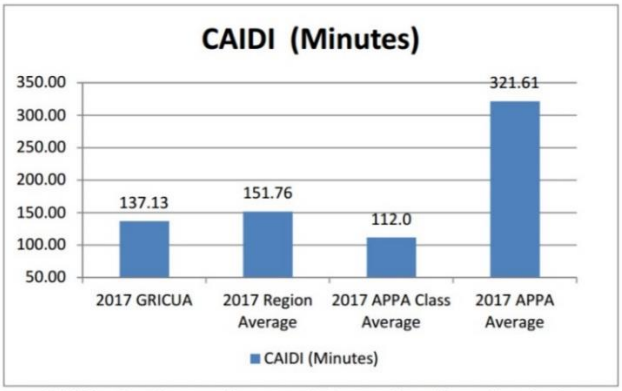
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



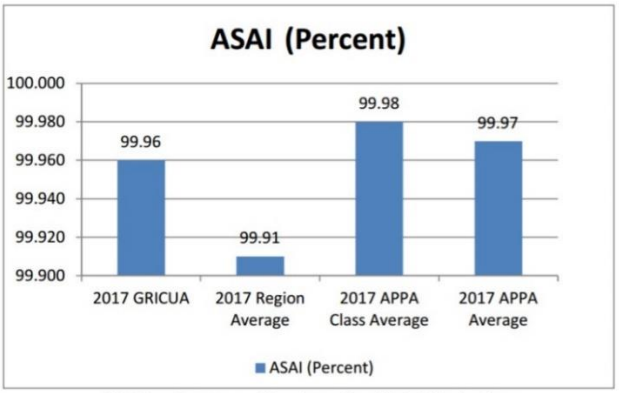
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for only those customers that experienced an outage.

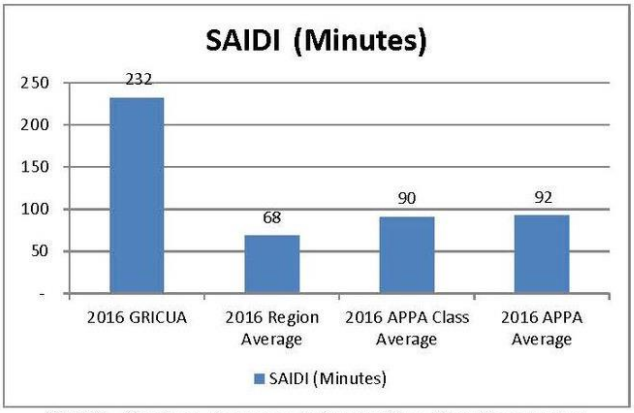


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

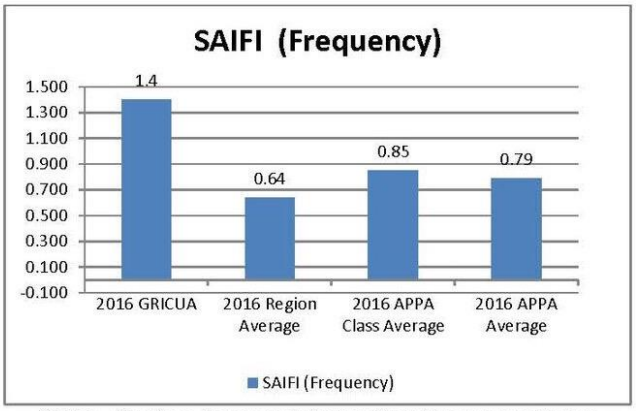
APPENDIX F

2016 GRICUA Reliability Indices Compared to APPA Data



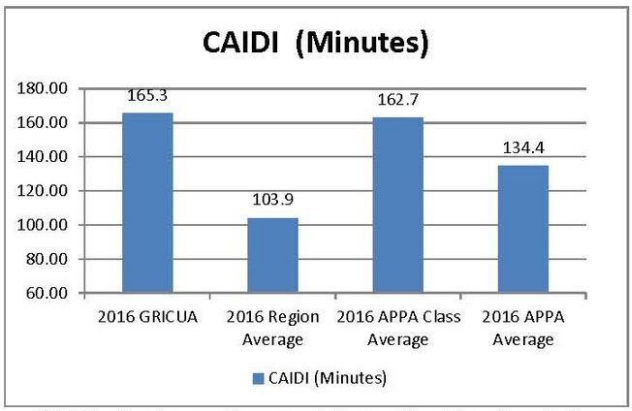
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



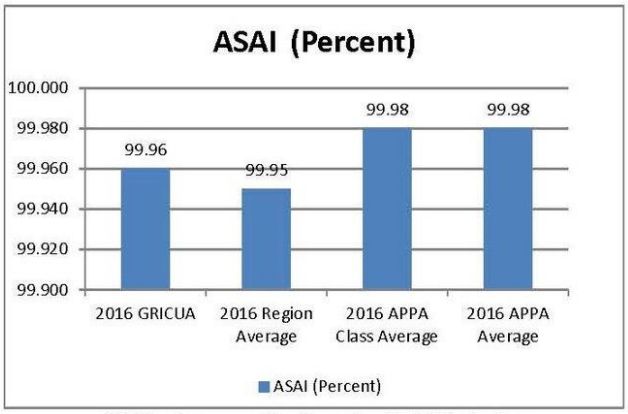
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for only those customers that experienced an outage.

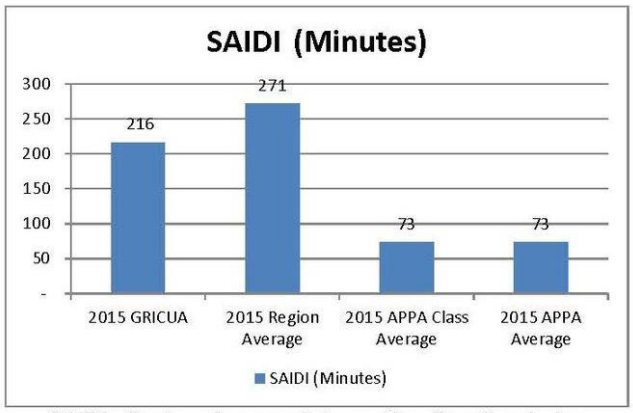


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

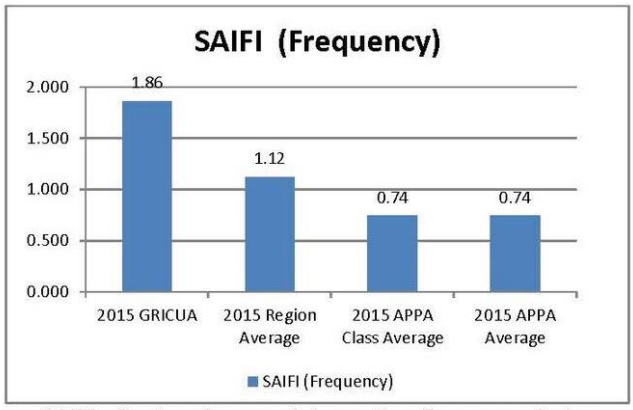
APPENDIX G

2015 GRICUA Reliability Indices Compared to APPA Data



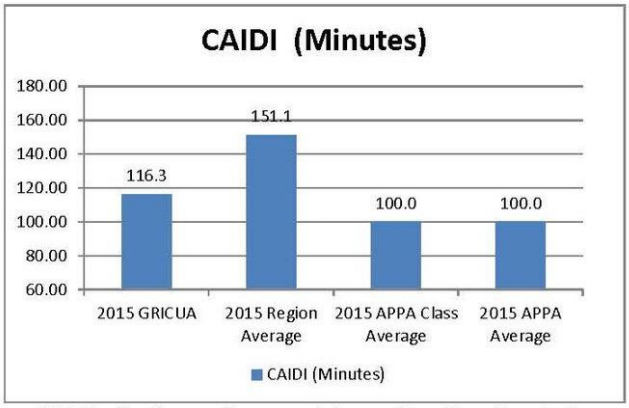
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



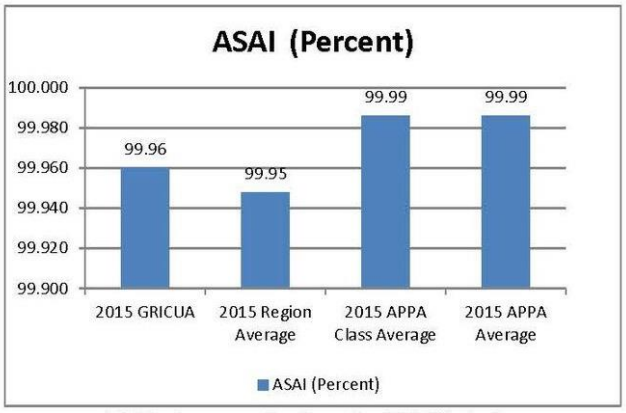
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for only those customers that experienced an outage.

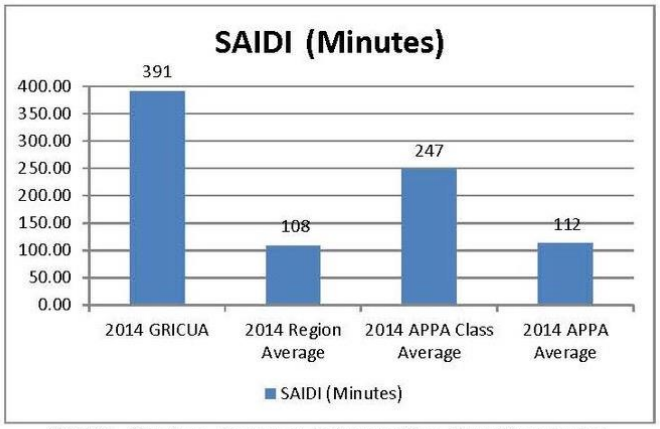


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

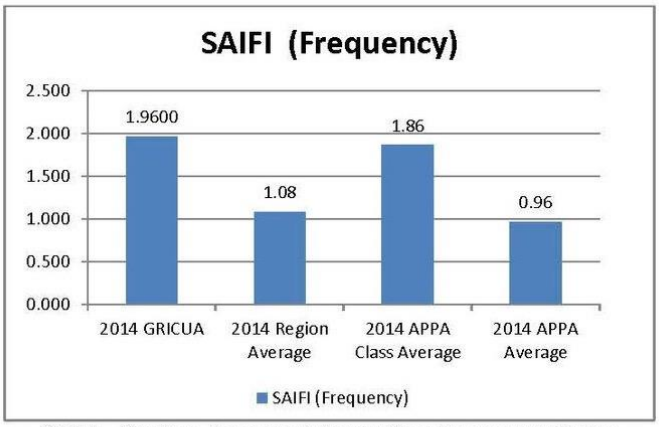
APPENDIX H

2014 GRICUA Reliability Indices Compared to APPA Data



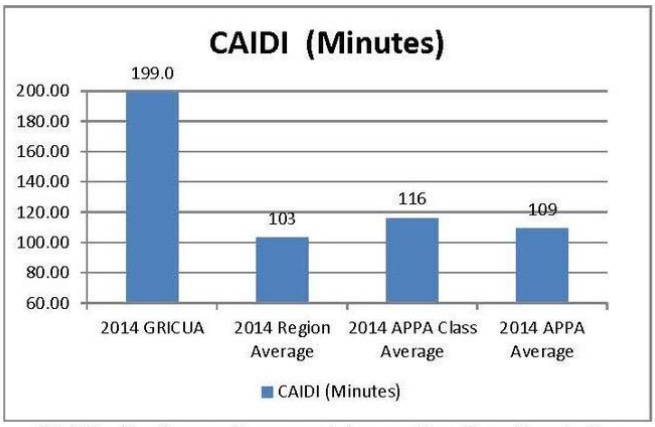
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



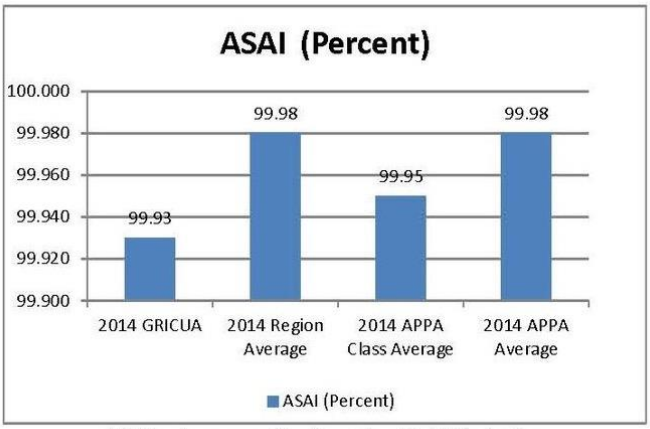
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for only those customers that experienced an outage.

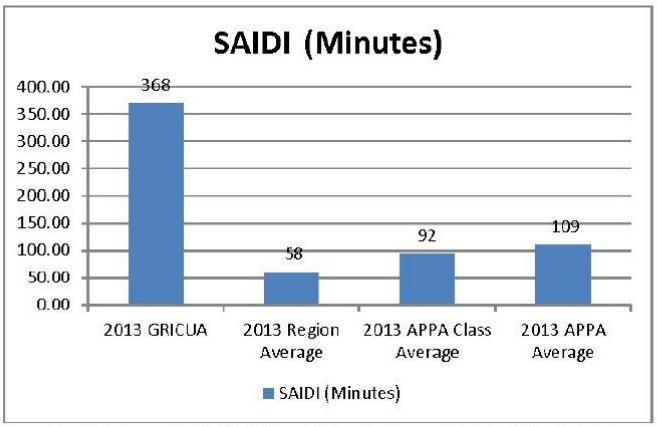


ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

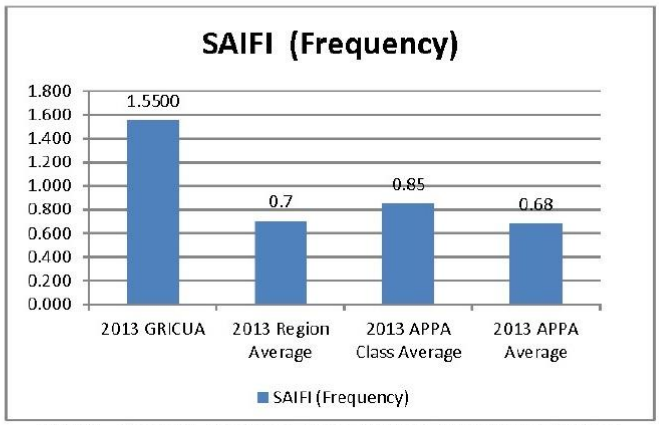
APPENDIX I

2013 GRICUA Reliability Indices Compared to APPA Data



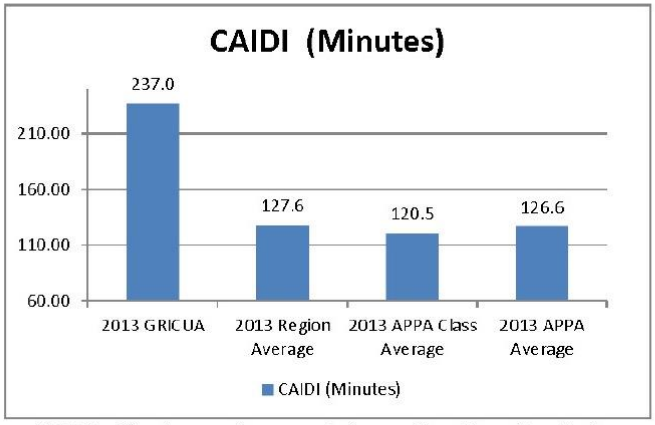
SAIDI - System Average Interruption Duration Index

Reflects the average duration of an outage for all customers.



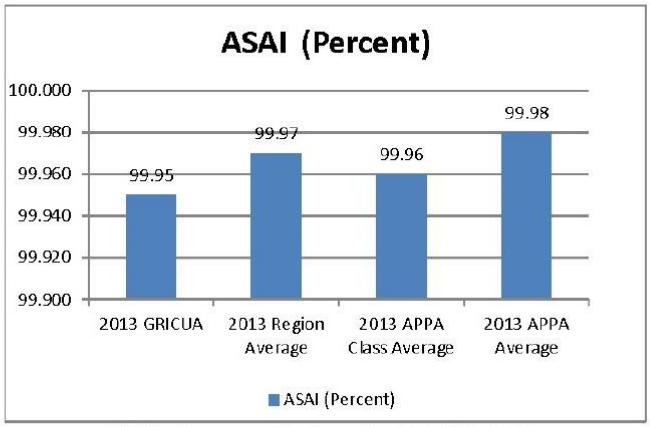
SAIFI - System Average Interruption Frequency Index

Reflects the average number of outages experienced during the period for all customers.



CAIDI - Customer Average Interruption Duration Index

Reflects the average duration of an outage for <u>only</u> those customers that experienced an outage.



ASAI - Average System Availability Index

Reflects the average percent that the system was available during the period.

APPENDIX J

Station Transformer	Details	Inspect/Test Schedule	Next Scheduled Date	Completed by/date
GRICUA LB - T1	Owner: GRICUA			
	Manufacturer: Waukeha			
	Size: 15/20/25			
	Yr. Install: 2003			
	Transformer test/maint	5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
GRICUA LB - T2	Owner: GRICUA			
	Manufacturer: Waukeha			
	Size: 15/20/25			
	Yr. Install: 2003			
	Transformer test/maint	10/5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
Park - PK - T2	Owner: SCIP			
	Manufacturer: Waukeha			
	Size: 20/25			
	Yr. Install: 2000			
	Transformer test/maint	10/5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
Park - PK - T1	Owner: SCIP			
	Manufacturer: Waukeha			
	Size: 20/25			
	Yr. Install: 2000			
	Transformer test/maint	10/5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
Casa Blanca - CB	Owner: SCIP			
	Manufacturer: Waukeha			
	Size: 15/20/25			
	Yr. Install: 2000			
	Transformer test/maint	10/5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	44075	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
Sacaton - SA	Owner: SCIP			
	Manufacturer: Waukeha			
	Size: 15/20/25			
	Yr. Install: 2000			
	Transformer test/maint	10/5 yr rotation	FY2021	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	44075	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	

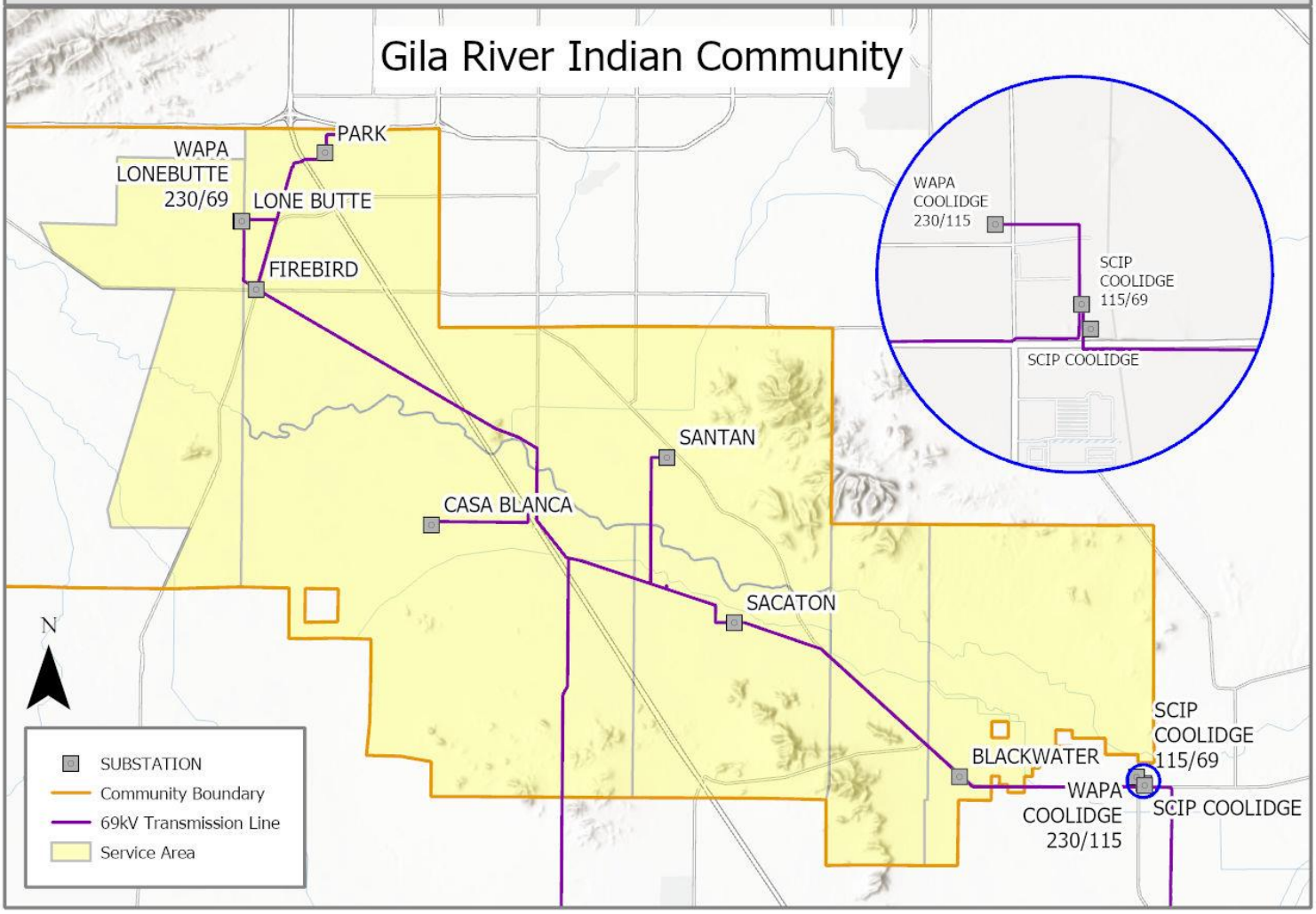
Station Transformer	Details	Inspect/Test Schedule	Next Scheduled Date	Completed by/date
GRICUA WHP	Owner: GRICUA			
	Manufacturer: Waukeha			
	Size: 28/37/46			
	Yr. Install: 2014			
	Transformer test/maint	5 yr rotation	FY2024	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2021	
	Exercise Breakers	annual	Winter 2020	
Park - PK - T3	Owner: SCIP			
	Manufacturer: Howard			
	Size: 20/25			
	Yr. Install: 2018			
	Transformer test/maint	10/5 yr rotation	FY2028	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2024	
	Exercise Breakers	annual	Winter 2020	
Desert View-DV	Owner: SCIP			
	Manufacturer: Howard			
	Size: 20/28			
	Yr. Install: 2018			
	Transformer test/maint	10/5 yr rotation	FY2028	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	2X annual	Fall 2020	
	Tap Changer	5 ys/100K ops	FY2024	
	Exercise Breakers	annual	Winter 2020	
Blackwater - BW	Owner: SCIP			
	Manufacturer: Howard			
	Size: 20/28			
	Yr. Install: 2015			
	Transformer test/maint	10/5 yr rotation	FY2025	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	replace annual		
	Viper	Annual		
Santan - ST	Owner: SCIP			
	Manufacturer: Virginia			
	Size: 10/12.5			
	Yr. Install: 2014			
	Transformer test/maint	10/5 yr rotation	FY2024	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	replace annual		
	Viper	Annual		
Firebird - FB	Owner: SCIP			
	Manufacturer: T&R ESC			
	Size: 10/12.5			
	Yr. Install: 2013			
	Transformer test/maint	10/5 yr rotation	FY2023	
	Transformer oil test	Annual	Fall 2020	
	Site & visual inspection	Monthly	Sep-20	
	Batteries	replace annual		
	Viper	Annual		

LIST OF ACRONYMS

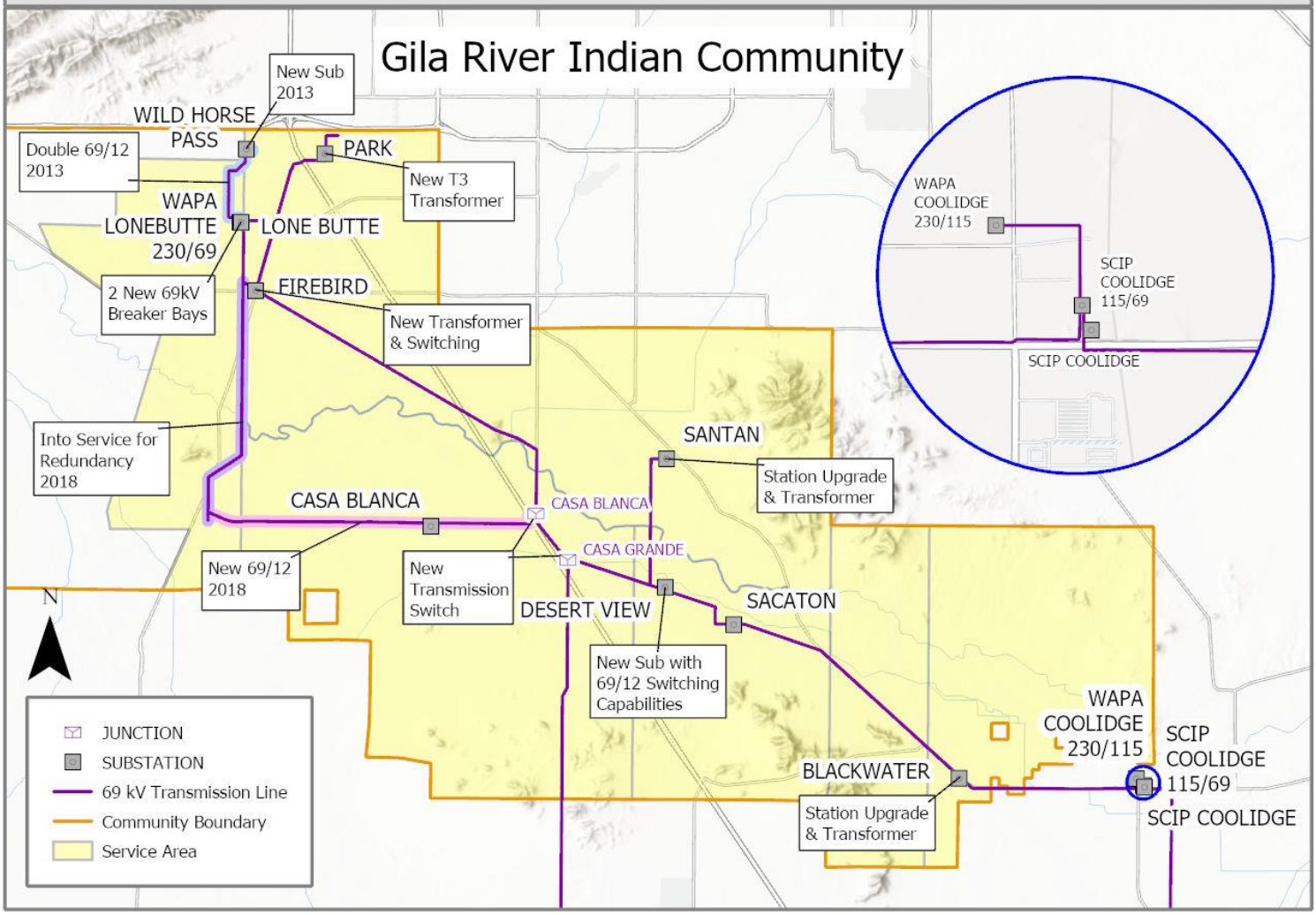
APPA	American Public Power Association
GIS	Geographic Information System
GRICUA	Gila River Indian Community Utility Authority
IR	Infra-Red
RMP	Reliability Measurement Plan
SCADA	Supervisory Control and Data Acquisition
SCIP	San Carlos Irrigation Project
SMSP	System Maintenance Strategy Project
UAS	Unmanned Arial System (drone)
UMMS	Utility Maintenance Management System

Appendix B – Diagrams Of Past, Current And Future 69 kV Transmission Lines And 12 kV Circuit Ties

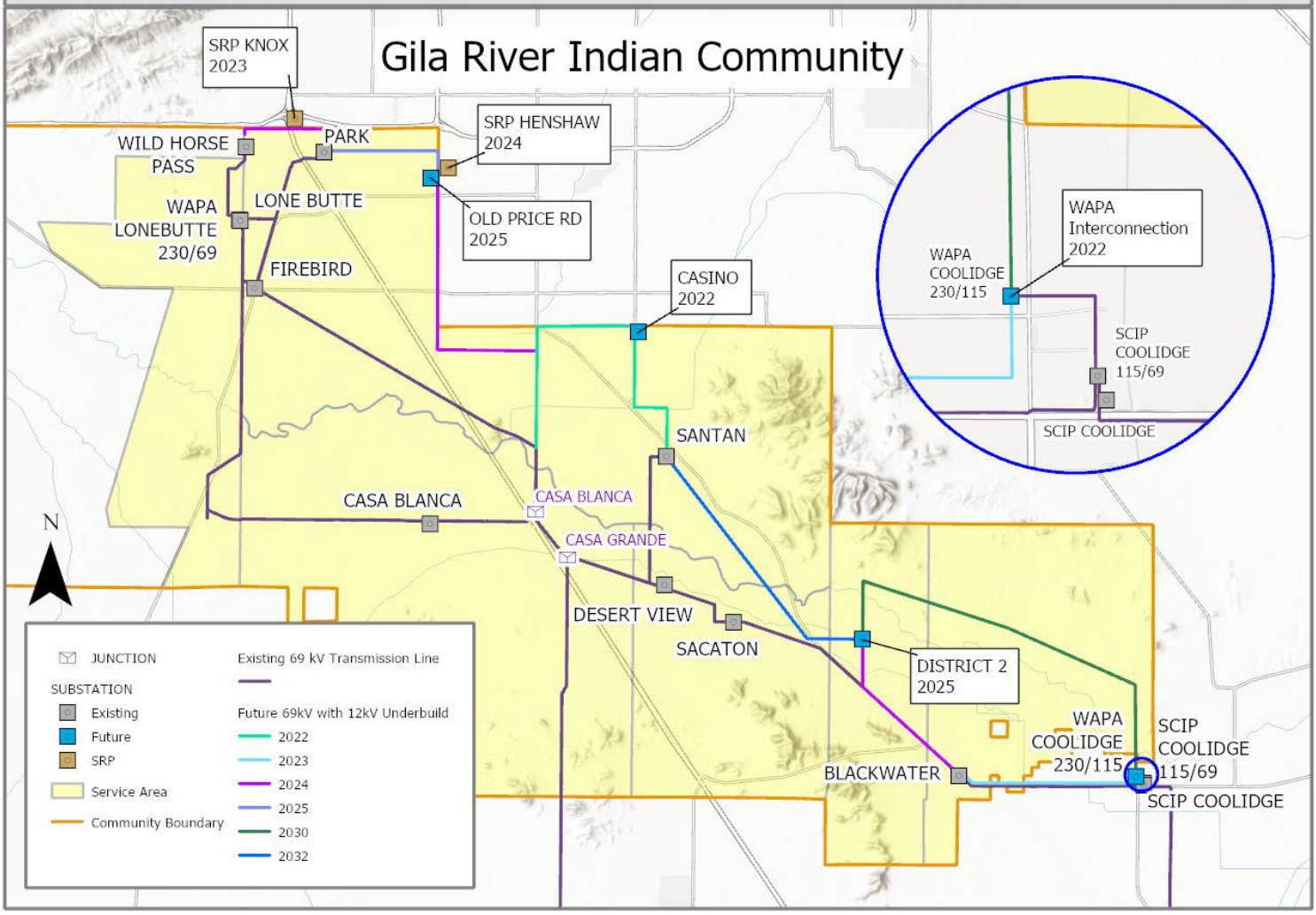
Appendix B - Diagram A: 2010 Substation and Transmission System



Appendix B - Diagram B: 2021 Substation and Transmission System



Appendix B - Diagram C: Future Substation and Transmission Plans



Appendix B - Diagram D: Distribution System Circuit Ties