LOS ALAMOS

Department of Public Utilities

Electric, Gas, Water, and Wastewater Services

FY 2026 ELECTRIC RELIABILITY AND RESILIENCE PLAN

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(FOR INFORMATION & DISCUSSION ONLY)

Contents

Reliability and Resilience

The true definition of reliability is the measured resilience of the system. This report is the update to the Electric Reliability Plan “ERP” and is a living-document. The purpose for this report is to have a path forward to achieve an electric distribution system that is resilient to exterior stress and system growth. A system that can maintain service during environmental changes. A system that can recover from external impacts and changes. An electric distribution system that can maintain a SAIDI of 60 minutes or less for the residents of Los Alamos County. The SAIDI calculations exclude PNM Wildfire prevention outages, transmission line outages and LANL supply line failures.

System resilience is achieved through the implementation of engineering best practices, effective operation management, and responsible financial administration. The steps to achieve system resilience are basic. Understand the strengths and weaknesses of the organization. Identify the threats, define the impacts of the threats, assess the vulnerabilities of the system, prioritize the risks of the threats, and develop solutions to mitigate the threats.

There is always a focus on actions to improve the system resilience. Capital projects have improved the main three phase system resilience and overall reliability. These projects have been able to minimize outage durations by offering redundancy in the circuit configurations.

The Los Alamos County Department of Public Utilities “LACDPU”, in this case electric distribution “ED”, spends most of its operational budget on reactive operations and maintenance “O&M”. Proactive inspections and assessments are ongoing. The department spends a great deal of time and funds supporting County, commercial and residential consumer projects.

The continued growth of the county has been a concern to management. The ability of the system to respond to growth and changing conditions is limited. Future actions are needed to prepare for and adapt to changing conditions. Proper planning and increased revenue will be needed to meet system demands. The County has plans to reduce and eliminate natural gas consumption in the county so this will lead us in the direction of an all-electric county. The increase in distributed generation and electric vehicle charging will add complexity and stress to the distribution system. The distribution system is not currently designed and constructed to support this objective. The complete reconstruction of the distribution system may be required. Ongoing efforts to address this issue include an ongoing contract with Burns and McDonald (1898). The services provided by 1898 included an assessment of the distribution system along with electrical engineering personnel. The electric distribution system model was updated to accurately model the system and simulate conditions under increased demand on the system. The project also looked at the trends of solar and distributed generation adoption by similar communities in order to forecast future growth.

Terms to Know

Resilience
The ability of the power sector to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions through adaptable and holistic planning and technical solutions. [1]

Reliability
A measure of whether a power system can provide regular, consistent power, typically defined by System Average Interruption Duration Index (SAIDI), Customer Average Interruption Duration Index (CAIDI), and System Average Interruption Frequency Index (SAIFI). [1]

Threat
Anything that can damage, destroy, or disrupt the power sector. Threats can be natural, human caused, or technological. Threats are not typically within the control of power system planners and operators. They may consist of wildfires, hurricanes, storm surges, cyberattacks, and others. This term is often used interchangeably with *hazard*. [1]

Vulnerability
Weaknesses within infrastructure, processes, or systems, or the degree of susceptibility to various threats. Different measures can be taken to reduce vulnerability or improve adaptive capacity to threats to the power sector. Vulnerabilities are typically identified through stakeholder interviews, technical analyses, and/ or literature reviews. [1]

Risk
The potential for loss, damage, or destruction of key resources or power system assets resulting from exposure to a *threat*. Risk is evaluated as the product of the *threat* likelihood and *vulnerability* severity scores.[1]

References,

1. **POWER SECTOR RESILIENCE PLANNING GUIDEBOOK**

A Self-Guided Reference for Practitioners
Sherry Stout, Nathan Lee, Sadie Cox, and James Elsworth
U.S. Department of Energy's National Renewable Energy Laboratory
Jennifer Leisch
United States Agency for International Development

Department Goals

Goal 1.0 Provide utility services safely, reliably and efficiently.

- The evaluation of outages and the assessment of the system is essential. Engineering will need to identify the threats to the system. The construction of a robust system that is engineered to withstand weather events and protect against contact with animals and humans. Identify the impact and consequences of power loss on customers. The impact on customers can include health, safety, financial loss and loss of access to vital services.
- Identify the vulnerabilities of the system, in planning, design and construction. The assessment of the distribution system identifies weaknesses in the system and allows engineering to prioritize and mitigate the weaknesses that make the system vulnerable to threats. Management will then develop emergency plans and procedures to mitigate the extent of and duration of system outages. The vulnerability of the system will include process definition and personnel experience.
  Proper training and periodic review of emergency response procedures will mitigate the threats and reduce the risks and eliminate vulnerabilities.
- Identify the cause and impact of power outages on the commercial customers. The nature of the County and its customers' demands reliable power. This is a highly educated and active community.
- Identify and prioritize the critical loads within the system. Repairs and replacements are prioritized by the number of customers affected and the duration of outages.
- Identify strengths and weaknesses in administration and management. The use of technology and proper process management aids management.
- Identify the risks associated with possible external threats. The risk of tree fall, animal contact or weather-related events are the main causes of outages. The system is designed and built to address these risks. These efforts are continuously reviewed and implemented by staff. The operation of the utility focuses on problem identification, repair, and mitigation. The outage data gathered is documented in the monthly reliability report.
- A detailed assessment of the system will be reported in December with the presentation of the Asset Management Report. System assessments will be completed in November and a report with budget recommendations will be developed.

County Development Plans

The County Master Plan for future development is a dynamic process. The County is now in the process of establishing a county wide broadband to home system. This effort directly involves the electric utility. The installation of fiber on existing power poles will require engineering review and operations construction.

The broadband utility, whether county owned or privately operated, will have to establish a pole attachment and conduit lease agreement just as Comcast and Lumen have done.

Each pole will have to be reviewed to meet NESC specifications. If the pole requires modification, the utility will perform the modifications and charge the broadband utility. This process will require additional valuable time from utility crew. Engineering will review each application for attachment and process the work orders as required. Engineering will also create Task orders and purchase orders as part of contract management.

Many new projects are proposed to increase housing in the County. The County is also moving forward with the installation of electric charging stations for various customer groups. The commercial charging stations will require three phase transformers for level 3 charging. The same is true for school bus charging and fleet vehicles. Level 1 and 2 chargers can be operated on single phase transformer. Each of these installations will require extensive line extensions to connect to the system. Electric switches will have to be installed to protect the branch circuits. Residential car chargers are not reported to the utility. The demand on the system will increase as these are installed in greater numbers. Time of Use (TOU) and demand billing charges will have to be implemented to assist in demand management.

The supply chain is not fully recovered. Most product costs and lead times are still providing difficulty.

Department Staff

The reliability of the system is only as good as the people operating the utility. Staff must be maintained to continue the improvement of the utility. Throughout the Covid years and still today, the electric distribution department has remained fully staffed and on duty. The entire department was on site every day throughout the pandemic period. This is a description of the utility staff and their function.

Engineering

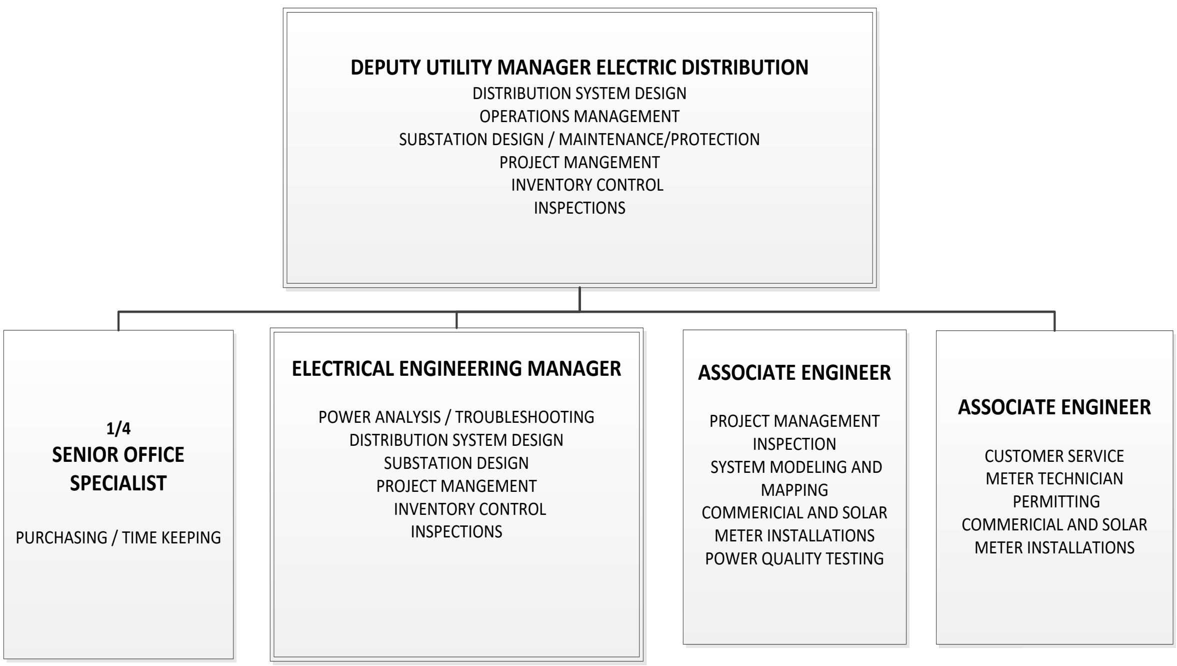
The administration and engineering department includes Deputy Utility Manager Dennis Astley P.E., Engineering Associate Mariano Montoya, and Engineering Associate Mariano Valdez. Dennis Astley has been with the department for 1.5 years. Mariano has been with the engineering department for just over four years. Mariano manages electric metering, project management and system modeling. Mariano Valdez has been in the department 1.5 years and manages new services. The Engineering Manager position is currently vacant.

The engineering department performs the following:

- Project In House Project Designs – For the Utility, County, Residential & Commercial
- System Assessments and Inspections
- Data Collection- Sensus, Munis, GE power systems, Sweitzer systems
- Project Development and Budgeting – Asset Management program
- Procurement and Inventory material management- Specifications, Purchasing
- Project Management
- System Modeling- AutoCAD and Milsoft

- System Protection- Relay and Recloser controls
- Substation construction and maintenance
- Switch Station construction and maintenance
- System Mapping – ArcGIS In house management
- Operations- Management, Design, Planning, Logistics, Work Orders and Support
- Safety and Training- Equipment Testing and Replacement
- Customer Service- Permits – Upgrades, New Construction, Solar
- Distributed Generation Management – Solar, Battery
- Electric Metering- Data Collection, System Analysis, Commercial Meter Installations, Testing, Customer Service.

Existing Electric Distribution Engineering Staff



Operations Management

Direct supervision of the electric distribution department. Thirteen Employees which include a line superintendent, three Supervisors, seven Linemen, Electrical Engineering Manager and two Engineer's Associates. Providing the crews with detailed project plans and switching procedures. Communicating effectively with Line Supervisors and their crews. Manage the ongoing procurement requirements to sustain operations, capital projects and system maintenance. Providing continued support to all County departments and their capital projects.

Metering

The analysis of the large commercial electric metering in the County is ongoing and will be furthered with the use of test equipment designed to test commercial meters underload. The monitoring of all commercial meters in the AMI project and the installation of radio repeaters and collectors. Review commercial accounts in conjunction with Utility billing. All new installations are inspected for correctness and the information provided to the billing department. The distributed generation meters in the system are being evaluated and documented accurately. All information is verified and confirmed by Engineering. The Smart meter program is supported by Engineering.

Outage Response

A major goal of any distribution system engineer is to minimize outages. The concerns include both the number of outages as well as the duration of these outages. The occurrence of outages is inevitable. Every outage is a learning experience in which proactive measures can be implemented to prevent future outages. Materials and equipment must be managed effectively to minimize response and restoration times. Appendix ‘A’ contains the process of outage restoration.

Safety

It is of the greatest importance that safety be an integral part of my training. Conduct meetings with all personnel to discuss switching procedures and job safety. Document and address safety issues as they are brought to my attention by the line electricians and other people. The department must also meet County training requirements. This year we began a line worker specific training program.

Office Management

Utilize office tools to maximize performance:

- AutoCAD- Prepare all designs and construction details
- ArcGIS – Update and maintain all Electric Distribution layers
- Munis- Update and maintain all Electric Distribution layers
- Sensus RNI – Software to monitor and retrieve data from meters
- Excel- Data Spreadsheets and graphs
- Visio- System diagrams
- Enervista- Software to monitor and program protection relays
- GE Power Management- Software to monitor and program protection reclosers
- Milsoft (WindMil) - Engineering analysis and modeling software – ongoing project
- Sweitzer Accelerator software for SCADA, relays and Reclosers

Assessment of Performance Measures

Project Management- Direct all aspects of Electric Utility Projects including development of the project plan, design drawings, budget, schedule, execution, and closeout. Communicate effectively and coordinate project activities with all affected agencies, departments, and stakeholders.

Standard of Measurement- Develop a well thought out project plan. Ensure that project quality assurance measures are implemented throughout the project. Execute projects with a high level of customer service and environmental stewardship.

Electric Condition Assessment -Direct the creation of work orders for condition assessment. Record findings and maintain records for future projects.

Standard of Measurement - Complete and accurate records of existing infrastructure. Information that is readily available to all engineers for use in design and troubleshooting.

Preventive Maintenance- Utilize information collected from condition assessment to develop necessary maintenance programs and projects. Provide evaluation and rating method for prioritization for projects to be done. Direct all aspects of project development and execution. Track maintenance programs to coordinate data collection and mapping.

Standard of Measurement- Ensure project prioritization, development and execution are effectively carried out. Projects are directly related to the improvement of system reliability and customer service.

Data Collection and Mapping - Conduct and coordinate data collection efforts with operations. Collect historical data of repairs and problems. Maintain As built drawings of current projects. Maintain system drawings in AutoCAD and ArcGIS. Provide information and data collected as part of the condition assessment. Coordinate mapping and presentation of data collection with Engineering. Meet all requirements of asset management.

Standard of Measurement**-** Well coordinated data collection and use of historical data. Maps produced and updated in a timely fashion. Assets are correctly accounted for and documented.

Training- Recommend training programs and equipment for electric distribution personnel to maintain safety procedures and awareness.

Standard of Measurement**-** Maintain a workforce that is certified and trained in all applicable work practices.

Customer Service- Assist customers in all aspects of Utility Department operations including Electric and GWS inquiries. Provide information on existing utilities and permitting requirements. Provide cost estimates and define customer responsibilities on commercial and large residential projects. Resolve customer grievances. Provide information to the Public Information office regarding outages and projects. Coordinate activities with other County departments.

Standard of Measurement**-** Maintain a high level of customer satisfaction. Meet requirements for public information.

Inspections -Conduct inspections of electric infrastructure according to defined schedules. Maintain inspection logs. Create Work Orders for inspections of battery banks and other equipment which require PPE and line electrician participation. Create Work Orders for maintenance of equipment.

Standard of Measurement**-** Maintain Utility records and comply with all defined requirements.

Materials Management –Define material requirements for all projects and normal operations. Order materials for projects and stage materials prior to project start date.

Work with warehouse personnel to identify procurement issues which cause inefficiencies and delays. Work with Supervisors to define ready stock requirements and maintain stock levels. Communicate effectively with management and procurement to resolve inventory issues. Work with management to define material specifications.

Standard of Measurement**-** Maintain inventory levels at levels which are sufficient to perform maintenance and execute projects.

System Protection – Inspect electronic system protection equipment according to defined schedules. Make changes to settings as defined by management. Download information as required to evaluate system operation.

Standard of Measurement**-** Operation of system protection as defined by management.

Operations Management:
Manage line crew work activities.
Develop work schedules.
Develop switching plans and staking sheets.
Inspect projects as required.
Responsible for procurement and inventory.
Conduct meetings and maintain documentation in the Asset Management Program.
Coordinate activities with other departments.
Respond to all outages as required.
Meet with the public as needed.
Respond to customer complaints and resolve them.

Work with contractors to successfully complete all projects.
Coordinate with and support Engineering in utilities and the general county.
Create and maintain drawings and maps.
Perform new installations and maintenance of commercial meters.

Electric Distribution Operations Staff

The electric operations department has ten qualified Journeyman Linemen. First a 4-person crew assigned primarily to the overhead distribution system to replace rotten poles, weathered cross-arms and aged or obsolete transformers. The challenge with the overhead distribution system is that a portion of it is at least 40 years of age and operate near or past its useful life.

A second 3-person crew is primarily dedicated to proactively replacing live-front and obsolete switchgear, transformers, and sections of underground power lines that have failed multiple times. Line crews also convert open secondary service lines to insulated triplex service lines.

The third 3-person crew primarily works on major capital improvement projects that replace the aged infrastructure but adds improved reliability features such as new line protection facilities, loops, tie-lines, or 3 phase conversions. These duties are in addition to customer service and the operation of the utility which occupies at least one crew each week full-time. New service connections, solar system installations, panel upgrades, power outages, power quality issues and customer concerns are some of the duties addressed by the utility line crews.

One lineman is responsible for onsite standby duty each week. The crew with the standby lineman will perform customer service disconnect/reconnects and answer all customer outage or trouble calls. This affects the ability of the crew to complete assigned projects. When required, all linemen will respond to large scale outages.

Existing Electric Distribution Operations Staff

Line Superintendent
Three Line Crew Supervisors
7 Journeyman Line Workers

Electric Distribution Projects

In Construction:
El Mirador Subdivision
Jemez Fire Protection Project
Lift Stations
El Mirador Subdivision
Arkansas Place Apartments
East Jemez Conduit intercepts for LASS feeders
LASS Feeder Conductor Installations
Padmount Switch Replacements

Designs Complete Awaiting Construction:
Trinity/Oppenheimer Primary Replacement
Piedra Loop/ La Senda Primary Replacement
Electric School Bus Charging Stations
Century Bank Project
Power Pole Replacements
East Gate Primary Cable Replacement
Overlook ballpark Communications Tower- Pending Procurement
Myrtle Apartments Master Metering- Pending Contractor Mobilization
Canada Bonita

In Design and Procurement:
Los Pueblos Electric Primary Replacement
Sherwood Rounds
White Rock Visitors Center Food Trucks and Pavilion
Middle School Gymnasium
Arbolada Subdivision
Los Alamos Center Plaza
Los Alamos Broadband Project

Future Projects in Planning:
EV Community and County Car Charging Stations
Fleet Electric Charging Stations

Distributed Generation

Los Alamos County now has over 537 customers in process or connected to the utility with Solar system installations. The connected load is 3560KW with 207KW pending (as of 3/20/2025).

The Department goal for distributed generation is 6000 KW (6 MW).

NUMBER OF CUSTOMERS	**557**
TOTAL KW	**4013**
CONNECTED KW	**3759**
Connected Residential KW	**3045**
Connected Commercial KW	**713**
KW Pending	**254**

The installation of the new AMI system improved outage response times with the implementation of the outage identification. The new Sensus meter software allows staff to see all meters affected by an outage. The line crews can then respond directly to the area without extensive troubleshooting and inspections.

Reliability Indices

LACDPU measures its system reliability with four (4) performance factors as defined by IEEE Standard 1366-2003.

SAIDI = System Average Interruption Duration Index. This is the total duration of interruption for the average customer during a predefined period of time; or

$$\text{SAIDI} = \frac{\text{Sum of all customer outage durations}}{\text{Total number of Customers Served}}$$

SAIFI = System Average Interruption Frequency Index. This is how often the average customer experiences an outage over a predefined period of time; or

$$\text{SAIFI} = \frac{\text{Total number of customer interruptions}}{\text{Total number of Customers Served}}$$

CAIDI = Customer Average Interruption Duration Index. This is the average time required to restore service; or

$$\text{CAIDI} = \frac{\text{Sum of all customer outage durations}}{\text{Total number of customer interruptions}} = \frac{\text{SAIDI}}{\text{SAIFI}}$$

ASAI = Average System Availability Index. This is the fraction of time that a customer has received power during the defined reporting period; or

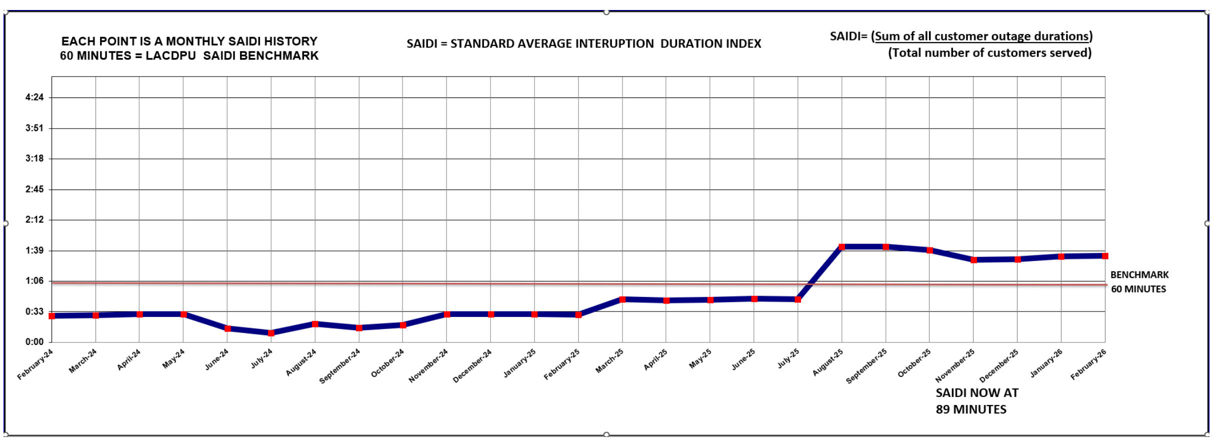
$$\text{ASAI} = \frac{\text{Service hours available} - \text{SAIDI}}{\text{Customer demand hours}} = \frac{8760 - \text{SAIDI}}{8760}$$

Table 1. Reliability Performance Measurement Factors as of 2/28/2026

Total # Accounts	**9045**	-
Total # Interruptions	24	-
Sum Customer Interruption Durations	**13471:56:00**	**hours:min:sec**
#Customers Interrupted	7223	
SAIFI	**0.80**	**int./cust.**
SAIDI	**1:29**	**hours:min**
CAIFI	**0.332%**	
CAIDI	**1:51**	**hours:min**
ASAI	**99.3487%**	

The calculations are based on a 12-month history. All outages' effects will remain in the calculations for one year as demonstrated in Figure 1.

Figure 1. Graph of LAC SAIDI



<u>Overview of SAIDI & Disturbances</u>

We continue to have sporadic and random underground line section failures throughout the system; and this can be expected into the future. Areas with direct bury conductors more than 30 years are subject to failure. During the fault identification, isolation, and re-routing of power (around failed line section), we've had some residual (secondary) failures. The issue is having to close-in into a faulted line with a standard 200-amp elbow. Some underground subdivisions may have 10 transformers daisy-chained, and the only recourse is close-in into the fault section one or two times. The utility installed fault indicators along the system to identify faulty sections of line faster.

Human causes of outages also occur due to digging. In these cases, the utility files a third-party damage report and charges the contractor for the repairs.

On the overhead system we've had a few outages due to tree contact with the electric lines. Tree branches blowing into the open-secondary (un-insulated) in consumer backyards. The ongoing replacement of open secondary conductors with insulated triplex conductors mitigates these outages.

The utility has an ongoing contract with a tree trimming contractor to proactively trim trees as they grow into power lines. Outages due to tree contacts has been reduced. The damage caused by a tree fall can be extensive. The value in having a resilient system is far worth the cost of trimming trees. The utility also prevents major pole and transformer failures largely because of our pole replacement and transformer replacement program. Although the transformer replacement program has slowed down due to supply chain constraints.

<u>Description of Distribution System and Impacts on Reliability</u>

<u>The Local Distribution Grid:</u>

The townsites source for power is a radial line from TA3. The loss of the canyon crossing will cause a townsite wide outage. Several sub feeders are available for service, but they cannot support the entire townsite. The single most important reliability project the department needs to undertake is the construction of a second switch station for the Los Alamos town site. The *Los Alamos Switchgear Substation "LASS"* is located at the County Eco Center site. The new switch station is critical to meet the future electrical supply needs of Los Alamos and will help maintain the system reliability success ED has demonstrated in the last decade.

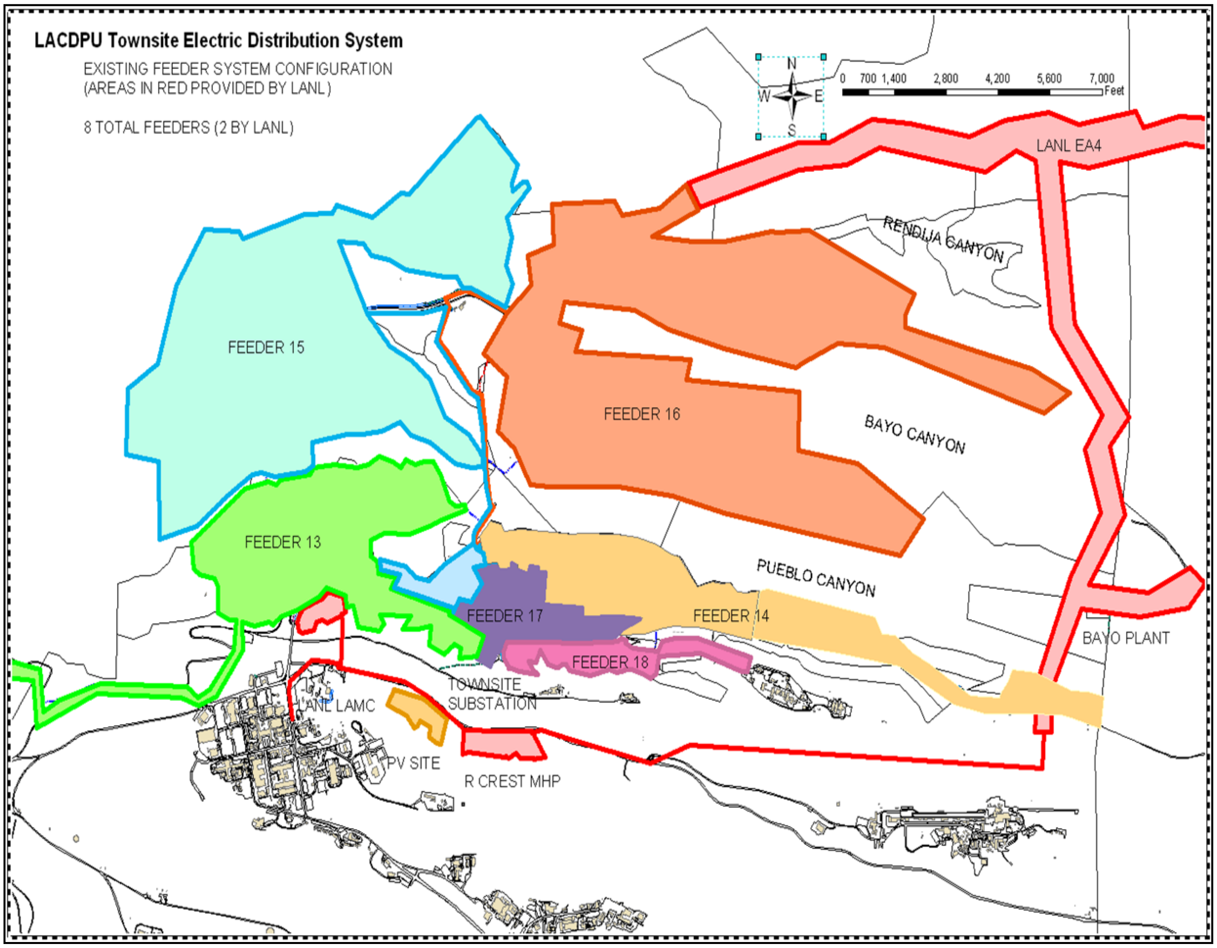
The addition of the LASS station will greatly assist in the redundancy of the supply system. The system as constructed will not support the full electrification of the townsite. The entire distribution grid will have to be reconstructed to support such an endeavor. The LASS has not been put into service due to issues getting circuits across the canyon. LANL has provided a duct bank to LAC and we will be getting bids to encase the asbestos containing conduit this year. With the asbestos pipe encased, the conductor can safely be pulled through the duct bank.

<u>Threats to the Distribution System</u>

The Townsite switch station serves almost 6500 customers with primarily 6 feeders; and a feeder outage may affect between 800 to 3600 customers. Figure 8. illustrates how having two additional substation sources will configure the Los Alamos distribution grid such that the 6500 customers can be served by 12 feeders: thereby substantially reducing the customers per feeder. i.e. potential feeder power outages would affect less customers in the future!

The Townsite switch station has six (6) feeders, #13, #14, #15, #16, #17, and #18. In addition, LANL provides *primary metering* points to LACDPU to serve other LAC customers via LANL distribution lines including Royal Crest mobile home park, NM Consortium Building, Los Alamos Medical Center (LAMC), Ski Hill, Pueblo & Rendija Canyons, and Totavi in San Idelfonso Pueblo. Overall, eight (8) distribution feeders serve the Los Alamos community as illustrated in Figure 2.

Figure 2. Townsite Electric Feeder Circuits



LACDPU owns and operates the Electric Distribution System (EDS) in Los Alamos and White Rock areas. The EDS is comprised of approximately 66% underground (UG) distribution and 34% overhead (OH) distribution serving approximately 8,500 customers. There are approximately 6,500 customers in the Los Alamos area and 2,550 customers in White Rock.

There are two operating distribution voltages in the LACDPU's system, 13.2 KV line-to-line (7.62KV line-to-neutral) in Los Alamos Townsite; and 12.47 KV line-to-line (7.2KV line-to-neutral) in White Rock. LAC can utilize the same distribution system components such as poles, fuses, wire, insulators, rubber goods, switchgear, etc. in both areas because the components are rated at 15KV line-to-line. However, LACDPU must keep different transformer inventories for Townsite and While Rock because of the different operational voltages.

Distributed Generations and Electric Cars

The electric distribution grid is absorbing production from PV installations. The impact of the reverse flows will soon exceed the capacity of conductors and transformers in the system. Electric vehicle chargers will increase the load on the system at traditionally off-peak times. This is stressful on the system because solar systems do not function at night. Homes that are currently installing solar systems are also increasing the size of their services to accommodate EV chargers and heat pumps. The upgrades to transformers and conductors required will be scattered throughout the county as areas are affected and show signs of stress or failure. Most repairs and upgrades will be performed by operations crews with operations budgets. The operating budget of the utility will have to be increased to meet the challenges.

Future Goals Set for an ALL-Electric Los Alamos County

The Utility Board of Los Alamos County set a future goal to eliminate gas consumption in the County. This would mean that all homes and businesses would be completely operated with electricity. The current distribution system will not support this as it exists today. Although the main backbone three phase systems have been upgraded, they would require replacement by 2050. The residential areas within the county are not adequately sized to handle the increased load. The utility will require the reconstruction of all residential areas within the county. In addition, a very large number of homes do not have the correct power panel size to provide whole home electric consumption. The homes will have to be upgraded, and new service lines will have to be installed. The increased addition of photovoltaic systems and car chargers is now having an impact on the distribution grid. Current staffing levels will not support the expansions and upgrades needed to move toward total electrification.

Age and replacement challenges

A portion of the OH system conductors exceed 40 years and are operating at or near the end of its useful life. Similarly, a large portion of the UG system was installed during the 1970s with cable technology that was good for 30-40 years. Therefore, LACDPU must plan to proactively replace those sections of the distribution network that experience and show signs of failure; having a 15-year replacement strategy is a good start. It will require over 24 million dollars over the 10-year period to accomplish this goal. This estimate does not include upgrades sufficient for all electrification. This estimate is with current inflation costs. Inflation will also increase in the near term. The utility needs a rate increase to keep up with the cost of operating the electric distribution system. Appendix B illustrates the age of subdivisions within the county.

Access to Infrastructure

The OH and UG systems have repair and replacement challenges which may impact the SAIDI as replacement projects are underway. Figure 3. illustrates a map area of inaccessible areas due to right-of-way encroachment or customer blockage. Having inadequate work access or having to work around landscaped areas, etc., make it difficult for LACDPU to replace rotten poles and overloaded transformers. For the UG system, having to dig in and around areas congested with buried utilities makes it difficult to dig for routine repairs; more so when having to install replacement lines. Overhead system replacement work needs to be performed while the existing power line is energized or while *hot*. *Hot* work safety procedures require the feeder over-current protection be disabled (from normal reclosing) while the work is being performed. This means that an inadvertent line contact may kick-out an entire feeder (or line section) while the *hot work* is underway. Similarly, and with underground systems, replacement of live-front (uninsulated) equipment will generally require an outage *before and after* the work; again, for safety purposes. Therefore, replacing portions of the existing system will generally require the disabling of the overcurrent protection, small power outages or switchovers, additional safety precautions, slower work processes, etc. Replacement projects may impact the SAIDI temporarily and will increase the cost of replacement.

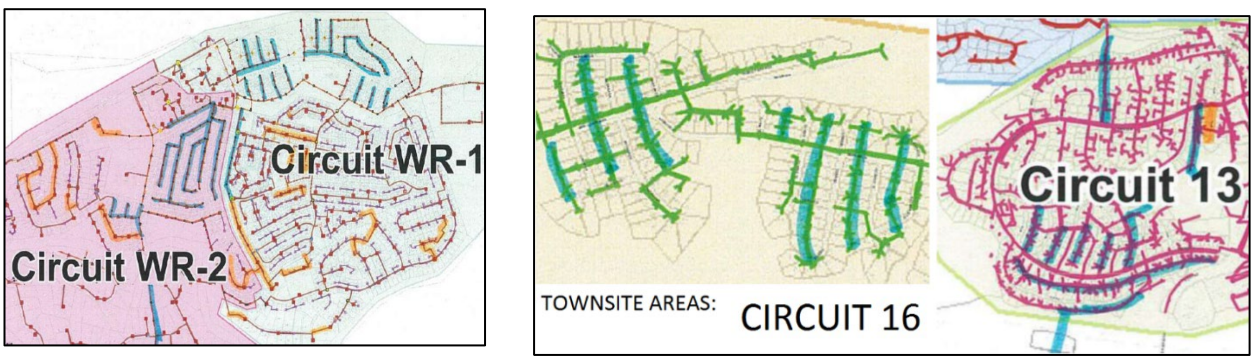


Figure 3. Areas not readily accessible

Maintain - Repair or Replace!

Through the Asset Management Program process, the lingering question is whether to maintain, repair or replace. Based in the Asset Management Program AMP, LACDPU will continue to operate under the following guidance:

1. LACDPU must adequately maintain its electric distribution system moving forward so that equipment can reach and exceed its useful life. For OH, this means pole inspection and treatment every 10 years for new poles and 5 years for older poles. For UG, this means continuing with the AMP features with respect to quarterly inspections & routine O&M.
2. LACDPU must continue to track repairs to its distribution system; after several failures, UG sections must be planned for replacement.

3. LACDPU must continue to prioritize replacement efforts to critical feeder sections which impact the most customers and have the biggest impact on the SAIDI.

The next sections provide short-term and long-term action plans, “Plans” that must be constructed in parallel largely because of the age of the distribution system. The Plans do impact the revenue requirements for the utility, but LACDPU is conscientious about implementing the Plans over several years. The LACDPU strategy is to continue to improve the system reliability yet maintain electrical rates below rates of neighboring utilities. Also, LACDPU will continue to ask for utility board feedback with regards to electric reliability, value, and the increased level of rates to support those two efforts. LACDPU’s goal is to strive to provide the highest level of reliable, utility service its customers expect to receive.

Discussion of Short-Term Action Plans

Asset Management Program (AMP) for OH

Under the department’s AMP, each of 10 crew members is responsible for his Feeder. Six linemen are assigned to the six overhead distribution feeders: 13, 15, 16, EA4, WR1 & WR2. Each year, the AMP program requires that each lineman perform quarterly line patrols, a detailed feeder assessment, and provide input with regards to feeder areas that require immediate and long-term action plans. For example, tree trimming, leaning pole, loose guy wire, etc. would be considered an immediate action. Feeder conversions, tie-lines, reconductoring, etc. would be considered long-term actions.

Overhead Pole Replacement Program

The EA4 overhead line is the connection between the townsite and Guaje/Rendija Canyons. The EA4 overhead line is the primary source of power for the townsite water system in Guaje canyon. The utility issued a contract for system design to replace the feeder. The replacement will be an upgraded system. The new lines will be transmission-grade with larger conductors to support future growth. The EA4 line can also be used as a back feed to feeder 16.

Infrared OH and UG line inspection

During the winter, the department will continue to *infrared* critical sections of the underground and overhead systems to look for hot spots as illustrated in Figure 4. Hot spots are areas that have loose connections leading to high-resistant points; these points will eventually burn up, fail, and cause a power outage.

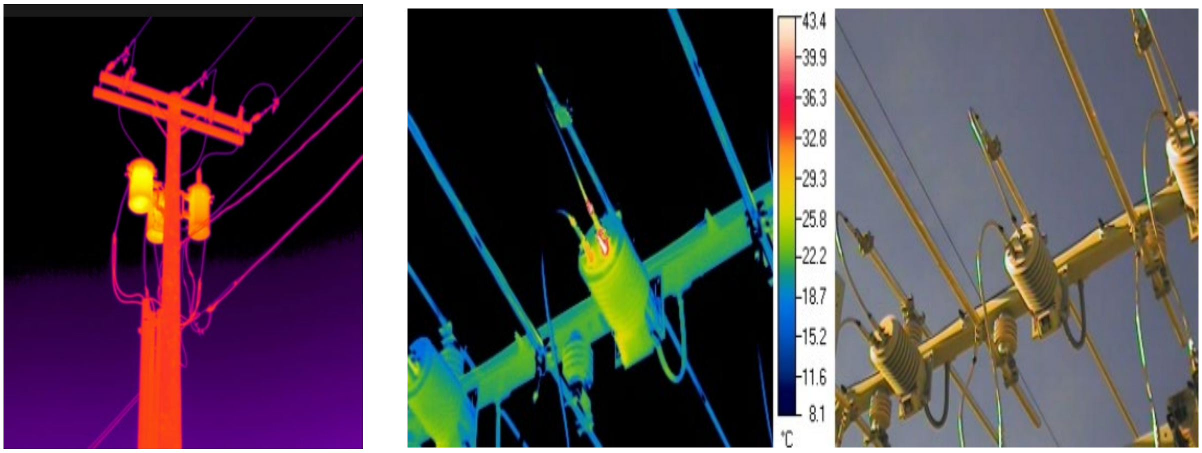


Figure 4. Infra-red picture for transformer pole & air break switch

Asset Management Program (AMP) for UG

Four linemen are assigned to the four underground distribution feeders: 14, 17, 18, & LAMC/Landfill. Similarly, each year the linemen perform quarterly line patrols, a detailed feeder assessment, and provide input with regards to feeder areas that require immediate and long-term action plans. For example, unleveled equipment, equipment oil leakage, rodent intrusion, equipment tagging, etc. would be considered for immediate action. Switch replacement, live-front transformer replacement, rust or oxidation painting, etc., would be considered a long-term action plan.

UG Primary Replacement Program

As previously stated, much of the existing primary underground distribution system consists of typical 1970s cable standards with 30–40-year cable life expectancy including: non-jacketed, direct buried, 175 mil insulation, XLP (cross link poly), non-strand filled cable. Today's primary underground cable has a 40–50-year cable life expectancy including: exterior jacket, 220 mil (more insulation), TRXLPE (tree retardant cross link poly) or EPR (ethylene propylene rubber), strand-filled and installed in conduit. Conduit has been installed in the county since 2001.
The department recently acquired a new cable pulling machine. The machine is equipped with a winch to pull cable into the conduit.

LACDPU continues to experience primary cable failures in subdivision areas, but mainly during the wet seasons. Moist ground tends to accelerate the *treeing effect* in the cable insulation leading to primary cable failures. The *tree effect* provides the shorting path, or *fault*, between the energized conductor and grounded neutral. When primary cable sections experience two or more *faults*, the line section is ranked with a low or high priority. When high priority primary line sections are designed for replacement, other engineering and reliability upgrade features are added. For example, radial lines may be converted to loops, single phase lines may be converted to three-phase, ridding of live-front equipment, adding sectionalizing points, re-routing for accessibility, etc. The idea is to ensure that even if the newly installed line fails, power can be restored even faster than before while impacting the least number of customers. Some examples include, the Canyon URD Project, San Idlefonso, Sioux Village, Del Note / Del Sol, Tsankawi, Meadow Lane, NM4, Trinity, Arizona, 35th street, 36th Street, Woodland, Club Road, 48th Street, Diamond Drive, 15th Street, WR2 Loop Addition, Trinity Apartment Replacement Project, NM502, DP Road phase 1, Rim Road, Connie, Cheryl, Aragon, Longview, La Paloma and the Los Alamos Medical Center LAMC. Replacement with the LASS Feeder project are projects which included loops, tie-points, and other reliability improvement designs as part of the original replacement project.

<u>New LASS Substation Addition</u>

The top reliability project for LACDPU is the construction of the new LASS Substation addition near the County landfill as illustrated in Figure 5. The LASS Substation is needed to maintain the SAIDI target into the future. LASS is also critical to the supply of steady and reliable electric power to the residents of the Los Alamos Townsite; more so if the Townsite area is expected to grow electrically.

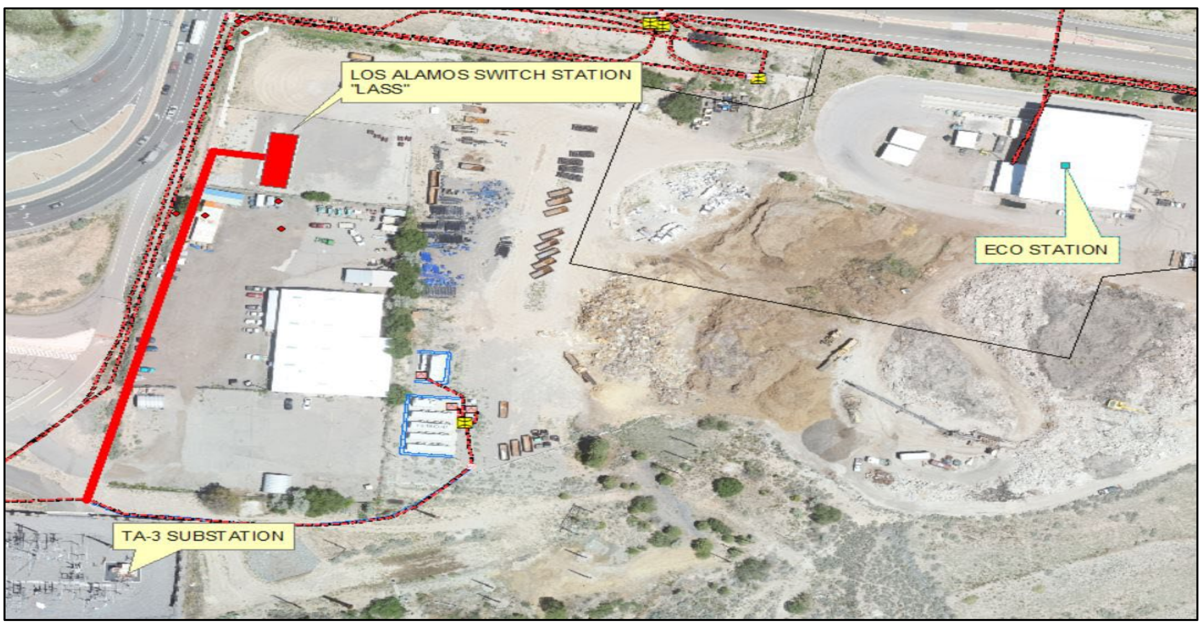


Figure 5. LASS station Location Relative to LANL

The LASS substation will relieve load from the existing Townsite Substation. The station will tie to TA-3 on breakers LC1 and LC2. Under existing conditions and for a TC1 feeder outage, the Townsite peak demand exceeds the TC2 feeder ampacity rating as illustrated in Table 3. below. The loading condition may worsen as Los Alamos County succeeds in bringing in electrical growth addition at the former 901 Trinity Site and DP Road.

Table 3. TC2 Feeder Loading for a TC1 Feeder Outage

Feeder	Size	Rating	Max Carrying Load	Townsite Peak Load
TC1	(2) 500 mcm CU	720 amp	16 MW	
TC2	1000 mcm Cu	615 amp	14.1 MW	16 MW

The LASS Substation will add feeder sources to maintain and improve the SAIDI and the system reliability in the Townsite area as illustrated in Figure 6. and as follows:

1. Reduce the number of customers on Townsite substation feeders 13, 15, & 16 (by moving half the customers on those feeders to LASS).
2. Provide new feeders 13T, 15T, 16T, S6, SM6.
3. Provide power to LACDPU customers with LACDPU power lines and not from LANL power lines, i.e., Transfer Station, LAMC (S6), Elk Ridge MH Park.
4. Add 50% additional system redundancy during scheduled or unscheduled outages to Townsite Substation Feeders. Feeders 13T, 15T, & 16T on LASS can back feed feeders on Townsite 13, 15, 16, Ski Hill and LAMC.

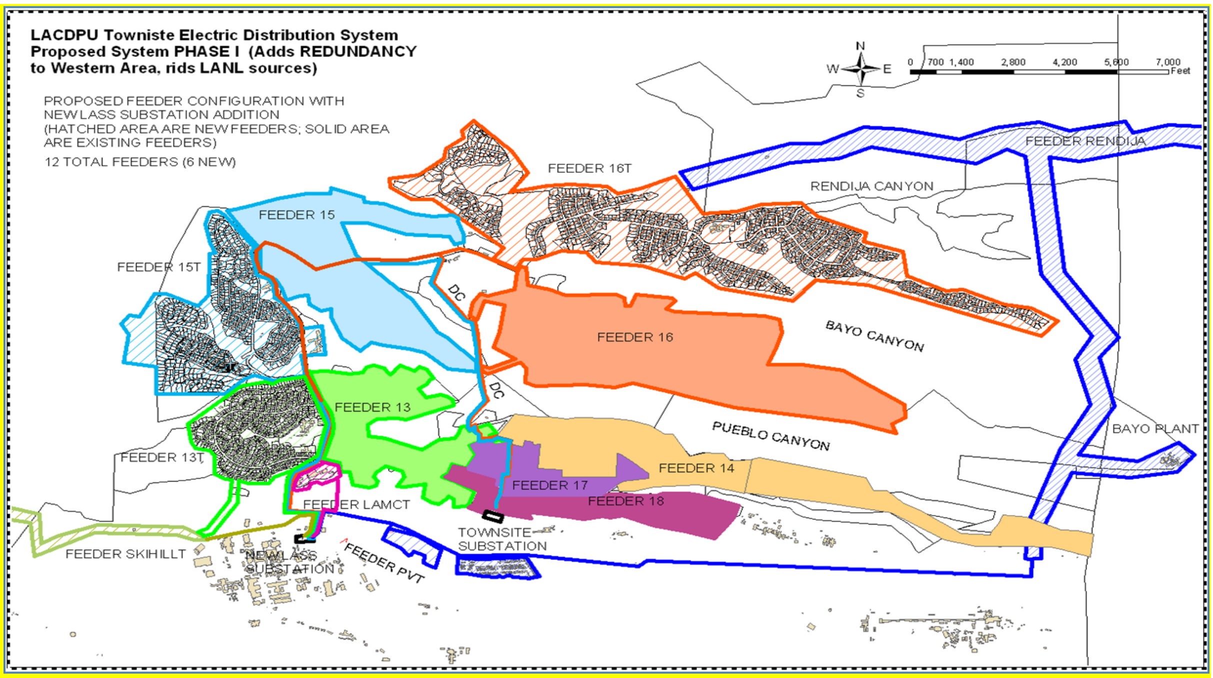


Figure 6. Los Alamos distribution area with LASS substation addition

SCADA and System Modeling

The LACDPU power production group (LACP) has SCADA capabilities at the Townsite and White Rock substations. LACP monitors the individual feeder relay for breaker status and real-time power flows. During a power outage, the LACDPU lineman must patrol the power line to find and isolate the problem; then, return to the substation to develop a restoration plan and restore power. LACP has dispatch locations at LANL TA-3 and PCS building #5.

The LACDPU electric distribution department will develop and install a SCADA system which will monitor the electric equipment in the field. The system will be based on Sweitzer RTU units called RTAC. The RTAC will communicate with all stations, relays, reclosers and line sensors. The system will incorporate information from the AMI, ArcGIS and the Milsoft Modeling system to provide real time system status to crews in the field and engineering. The new SCADA system will be based in Building #5 at PCS.

Electrical Engineering utilizes an electric distribution modeling system developed by Milsoft. The system is called WindMil. The model provides essential information on circuit loading and connectivity options. The model can analyze circuit configurations to ensure that circuits are not overloaded, and loads are balanced. The model is a living system that is modified as improvements are made in the system. With the implementation of a SCADA system, the model will provide real-time system performance. The Milsoft package can then be expanded to provide a full real-time outage management system. The information will be accessible to linemen and engineers remotely also to assist in outage response. This is the future of the system.

Feeders 13 and 16 have four-feeder line electronic reclosers (EOCRs) that will be integrated into the SCADA system. The EOCRs will be replaced and retrofitted with a SCADA card, a cell modem, and integrated into a new communication system. Feeder 15 is in the process of having a new recloser installed. These *node additions* can be mapped into the SCADA system for remote monitoring. With SCADA control, an outage can be detected by LAC electric distribution crews and immediately be aware of the power outage area. Linemen can then be dispatched directly to the problem area and not have to rely on customer outage calls. When the linemen isolate and repair the overhead power line problem, the lineman can restore power quickly.

Similarly, and after the new LASS substation is constructed, all *back feeding* tie-points can be fitted with SCADA system radios.

In summary, developing a new SCADA system into the distribution feeder network will help LACDPU identify outages quickly; allow lineman to be dispatched directly to the problem areas, and allow LACDPU the ability to re-route power and restore power quickly and efficiently.

Discussion of Long-Term Action Plans

Three Phase Primary OH Backbone Rebuild

Table 4. illustrates the feeder length of the main three-phase OH back bone system with pole quantities. The long-term plan is to replace all three phase back bone poles to ensure the long-term reliability; a single major back-bone pole failure could potentially impact thousands of customers. Single-phase pole laterals which serve less than 50 customers will be replaced on a lower priority basis. The main canyon crossings have been replaced.

FEEDER #	# OF POLES	MILES OF LINE
13	81	3.44
Ski Hill	70	3.5
15	111	3.15
16	137	4.53
WR1	65	1.83
WR2	73	3.41
EA4	150	9
TOTALS	687	28.86

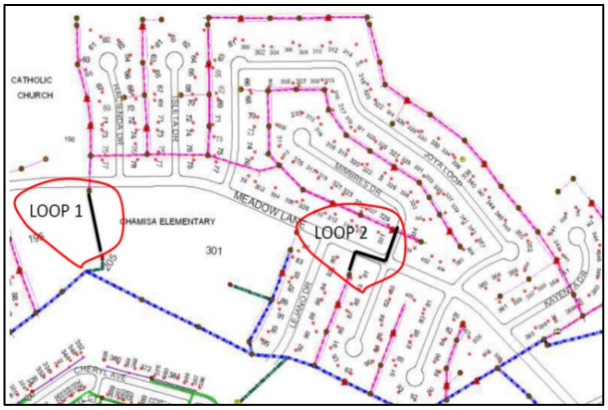
Table 4. Three Phase Main Feeder OH Backbone Lengths

Primary UG Improvement Projects:

Major underground replacement projects or additions were constructed in the past: 0.8 mile, WR2 Loop Addition, 1.2-mile, Canyon Road Rebuild Project, and 1.0 mile, Tsikumu Village Primary Replacement Project. The three projects have become burdensome to LACDPU customers and affected the SAIDI year after year. The projects not only replaced the failed underground sections but also added three phase power line sections and new single phase primary loops. Each small project cost about $800K and it will be difficult to sustain those types of projects in the future without impacting utility rates. Costs for materials are rising rapidly.

Major underground capital replacement projects have been identified in the immediate future by the asset management team. LACDPU is prepared to deal with major SAIDI impact projects as they may arise in the future. A list of major projects includes the Los Pueblos, La Senda and Pajarito Acres, Timber Ridge, La Vista and Big Rock Loop.

Other long term UG projects which will provide long-term reliability improvement is the addition of new UG or OH Loops. LACDPU has many radial lines which power anywhere from 30 to 100 customers; a failure on the radial line leaves few alternatives to restore power in a timely fashion. By identifying these long radial power lines, LACDPU can install new Loops within reasonable costs. Figure 7. illustrates priority areas for Loop additions in White Rock.



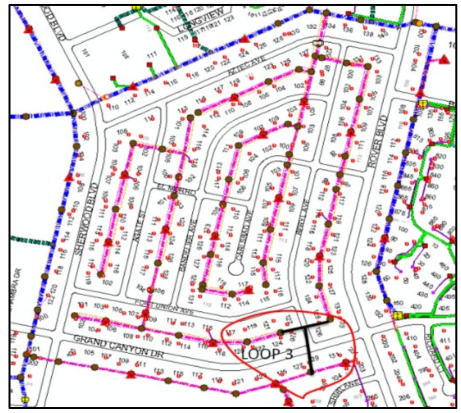


Figure 7. Single Phase Loop Addition Targets in White Rock

The LACDPU has many underground subdivisions with single phase primary laterals with 10+ transformers configured in a daisy-chain. When LACDPU experiences a faulted line section, it must identify the fault, isolate it, then back feed the outage area from a new power source. Back feed is done by manually transferring electrical load with a 200-amp elbow; at least two times during the restoration process. With continual line section failures, the manual back feeding process is resulting in secondary and residual failures, i.e. elbows or other weakened points. Therefore, LACDPU must look at other engineering solutions in identifying and isolating failed line sections so that no secondary or residual failures occur.

<u>New Supply Line from the Jemez Coop and the San Idelfonso Pueblo</u>

Discussions have been underway to install a tie between the PNM Transmission line on Pueblo land to the county of Los Alamos. The plan to install 50MW of solar and tie to the County is in consideration. It will require many improvements and a new substation to transfer power across the river and up Rendija Canyon.

<u>Future Capital Projects</u>

10 Year Capital Project Plan ($34.1 Million over 10 years)

2025 - SKI HILL $2,800,000
2025 - OPENNHEIMER / TRINITY / TIMBER RIDGE $1,200,000
2025 - 2026 - PIEDRA LOOP $ 550,000
2025 - 2026 - LOS PUEBLOS $1.0M
2026 - 2027 – Aragon, Ridgecrest, Garver, Catherine $1.5M
2026 – 2027 – Quemazon, North Road $750,000
2028 – Sandia, 41st – 47th, Ridgeway Tie $1M (Bond)
2028 – Grand Canyon, Bryce, Richard Ct, Rover $2M (Bond)
2028 - EA4 RECONSTRUCTION $7.5 MILLION (Bond)

2029 – Tewa, Otowi, Nambe Loop, Santa Clara $1M
2029 – La Senda $1.5M
2030 – Oakwood Loop, Nugget, Opal, Pinon $1.8M
2030 – Rover, Ridgecrest $1.9M
2031 – Sage $1M
2031 – Kimberly Loop $1M
2032 – Trinity from Diamond to Oppenheimer $1M
2032 – Briston Pl, Brighton, Paul Place, Todd Loop $600,000
2033 – Los Alamos Replacement $1M
2033 – White Rock Replacement $1M
2034 – Los Alamos Replacement $1M
2034 – White Rock Replacement $1M
2035 – Los Alamos Replacement $1M
2035 – White Rock Replacement $1M

In Summary

In 2001 the Cerro Grande Fire North community reconstruction began and was completed in 2004. In 2006 the first system wide condition assessment was completed. LACDPU was struggling with the system reliability and the SAIDI was over 5 hours per consumer. At that time, there were many problems in the distribution system and LACDPU needed to develop short-term and long-term action plans to address the different infrastructure issues. In 2005 the townsite switch station was installed providing new breaker control and feeder separations. The cross-canyon loads were separated from the downtown circuits. In 2005 the White Rock substation Unit 2 failed and was replaced in 2006 with new switchgear which provided the additional WR3 feeder. In 2010, the department developed an Electric Reliability Plan, "ERP"; the ERP identified the issues and problems into three different work areas: engineering, overhead, and underground. The 2010 ERP described the strategy for the short-term and long-term action plans in the three work areas. During 2010, increased revenue funds were authorized to address the different action plans and the SAIDI steadily decreased. The workload was tough and LAC-DPU crews all too often functioned in a reactive mode, i.e. a problem occurs, fix it, move on to another problem.

Also in 2011, the ERP was updated, and the action plans were updated as well. Increased revenue funds were authorized to continue with the action plans and the SAIDI continued to decrease. By 2012, the ED department had started to catch up with the increased workload and the department reorganized its FTES (full time employees). Two operations staff retired but were replaced with two new linemen; this allowed the department to develop a third line operations crew.

By 2013 and 2014, the ED department was able to catch up enough that 2 crews were primarily assigned to pro-active O&M and replacement projects. For the first time in recent memory, LACDPU can properly plan and replace sections of the electrical distribution grid which have failed in the past. By the same time, LACDPU had met its SAIDI target. However, the SAIDI target would not have been possible without the increased revenue and operational funds authorized.

In 2019 the engineering staff was reduced with the resignation of the Deputy Utility Manager for electric distribution. In 2020 the COVID pandemic shut down the supply chain and most operations. Construction of housing did not slow down, even as lumber prices skyrocketed. In 2020 an associate engineer was hired, and he resigned in 2021. In 2022 a new associate engineer was hired and is now active in the engineering program. The availability of electrical engineers is diminished. It will be difficult to maintain skilled electrical engineering staff in the future. Planning for future upgrades is dependent on the funding and labor provided to the department. The current disasters in the United States have continued to produce a supply chain crisis. Costs continue to be escalated and lead times are still an issue. The department may require the addition of FTE positions to meet the goals of the County Administration.

The Asset Management Program incorporates field inspections from the linemen into the system condition assessment. The linemen provide the necessary information to prioritize system replacement requirements. These requirements are then entered into the next budget cycle for the Utility Board and Council.

Though LACDPU met the SAIDI target of 1 hour or less prior to a transformer failure, there are still challenges ahead. The drive to meet the SAIDI target begins with the consumers who expect a steady and reliable electrical supply but ends with them as well; because the consumers must sustain the electrical rates which provide the revenue stream to meet and sustain the SAIDI target. However, LACDPU recognizes the balance between electric reliability with the retail cost for electricity within the neighboring utilities AND how much LACDPU consumers are willing to support. Therefore, LACDPU will continue to engage its consumers through a consumer survey on this issue. Also, Increased installation of solar panels in the county and energy conservation measures are decreasing revenue to the department.

Appendix A:

OUTAGE RESTORATION PROCEDURE

The purpose for this document is to formalize a **consistent procedure** when responding to outages affecting the substation breakers or electronic and hydraulic reclosers “OCRs”; collaboratively referred to OCDs.

BACKGROUND:
As you are aware, Engineering and Operations is continuously being graded on its SAIDI which is the Sum of Customer Interruption Durations / Total number of consumers. The goal is to have a SAIDI less than 60 minutes but ours consistently exceeds that value. At the present time, maintaining a SAIDI of 60 minutes will be difficult to achieve due to the age of our electrical system and the lack of system redundancy. As we continue the overhead rebuild process, continue our bad underground replacement strategy and add additional substations, the SAIDI will trend down. In the meantime, though, it is very important that we don’t impact the SAIDI more than necessary during the outage restoration process. The following procedure attempts to minimize outage time but also makes you aware of the potential impacts of energizing the OCDs under 3 phase conditions.

FACTS ABOUT OUTAGES:
According to NRECA and other studies, 70-80 percent of Faults on overhead systems are temporary or of a transient nature. In addition, 70% of all Faults are single-line-to-ground Faults. What this means is that 50% - 56% of the time, RESETTING the OCD and CLOSING IN (on 1 shot) will restore power. However, it’s also important to recognize that 30% of the time, a larger problem such as phase-to-phase, 3 phase Fault, “tree online”, “downed power pole”, etc. could exist. Energizing a PH-PH or 3PH fault creates substantially higher fault currents than 1 PH faults thereby potentially causing greater equipment damage; even worse, energizing a permanent fault near human contact could be disastrous.

Therefore, the following procedure shall be used when responding to OCD type outages:

When a breaker operates – call the **Deputy Utility Manager – Electric Distribution** and begin public information procedures.

Obtain outage information from the Meter Management System. Determine which protective devices have operated.

STEP 1:
BEFORE you energize an OCD, INTERROGATE the substation breaker or OCR control. **Here's what you want to look for**:

- 2 or 3 Phase Faults (other than 1 Ph).
- Ph to Ph (or 2 phase) generally means "slapping of lines" - watch for that on long spans (such as canyon crossings).
- 3 Ph Faults generally means something fell across line, pole down, etc. i.e. a PERMANENT Fault, don't RECLOSE but start patrolling; look for areas with trees, call dispatch to see if anyone reported an accident;
- Faults higher than 4000 amps for **Townsite**; a value this high is within **the first mile** and so take a quick patrol before energizing.
- The OCDs are preprogrammed to provide a distance to the Fault, look for that value and phase.
- Faults around 3000 amps are immediately downstream of the OCRs at North and Barranca Mesas, perform a quick patrol.
- Faults higher than 3000 amps for **White Rock** are within 0.75 miles; 2200 amps (Rover) - 1300 amps (Sherwood) are at the end of the lines.

STEP 2:
If you do want to close the OCD (remember it's OK 55% of the time), FIRST, **place the OCD on Non-Reclosing** or 1-Shot before energizing.

- For the Multilin substation breakers, place the breaker on "Recloser Disabled". Note: any operation within 30 seconds after a manual close, even when placed on NORMAL (reclosers ENABLED), will lock-out the breaker; we experienced this before.
- For the ABB OCRs, place the breaker on "Recloser Blocked".

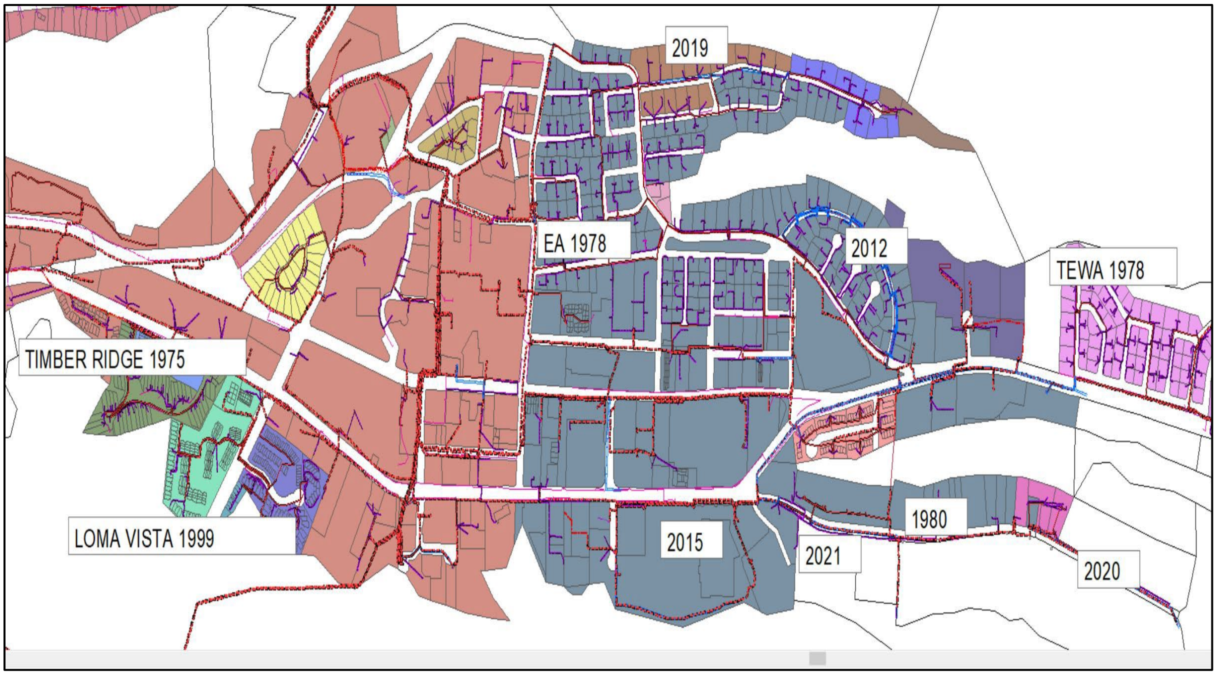
STEP 3:
If the OCD holds after several minutes, place the OCD back to NORMAL by disabling the Non-Reclosing or Recloser Blocked functions or Enabling the Recloser Function.

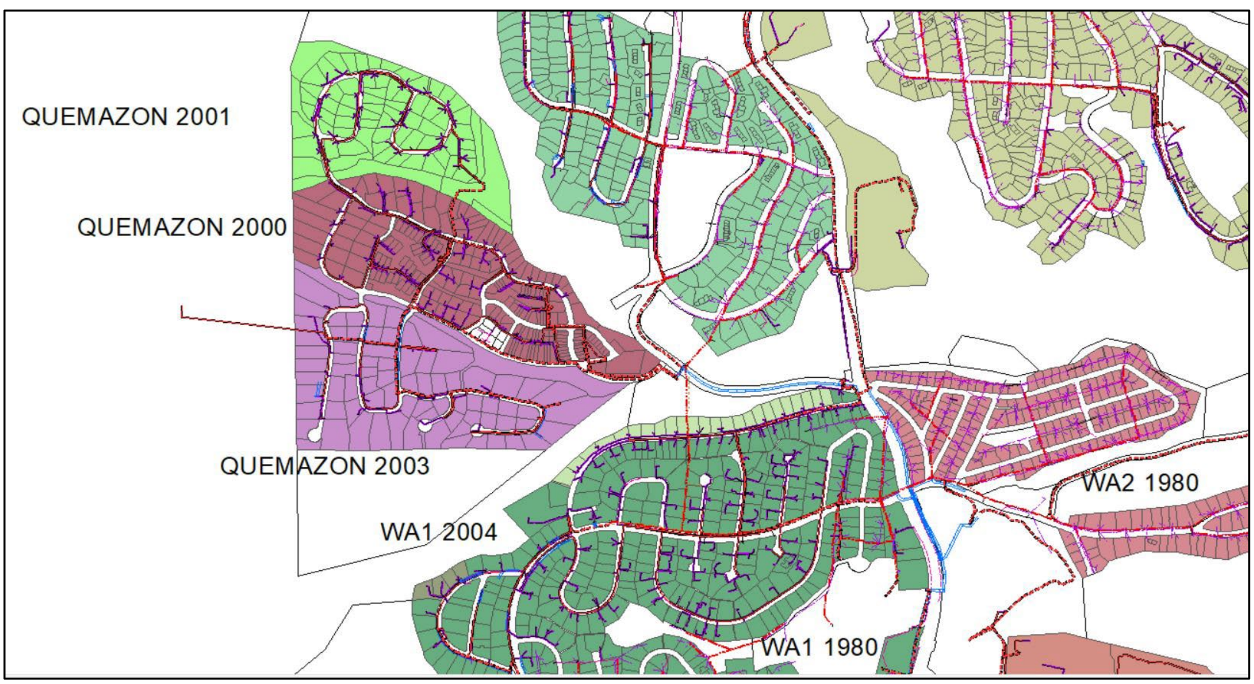
ADDITIONAL INSTRUCTIONS:

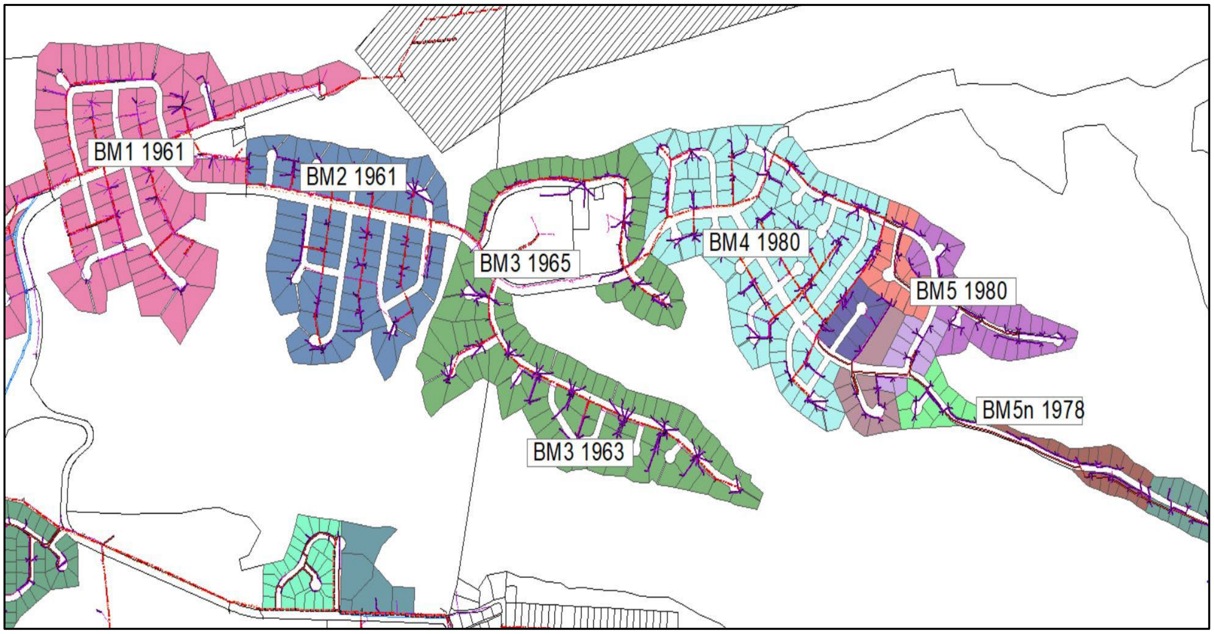
- Do not respond to the FIRST OCCURRENCE when Dispatch calls about a voltage sag or blink to the LANL system. When there is a substation breaker operation at The LAC Townsite substation, EVERYONE tied to the substation (including LANL) will experience a voltage sag or flicker. Keep note of the occurrence; if the problem persists SEVERAL times (say 3 blinks), then go to the substation, determine which feeder experienced the operation, interrogate the OCD, and patrol.
- Similarly, if someone calls that their lights went off-and-on; take note of the call but don't respond unless it happens on SEVERAL occasions. It's obvious the OCD/OCR is doing its job; recall that 70-80% of Faults are momentary or transient in nature.
- In either situation, notify Stephen Marez about the incident on the following day. We will then download the OCD information and follow up on the cause and location of the disturbance.

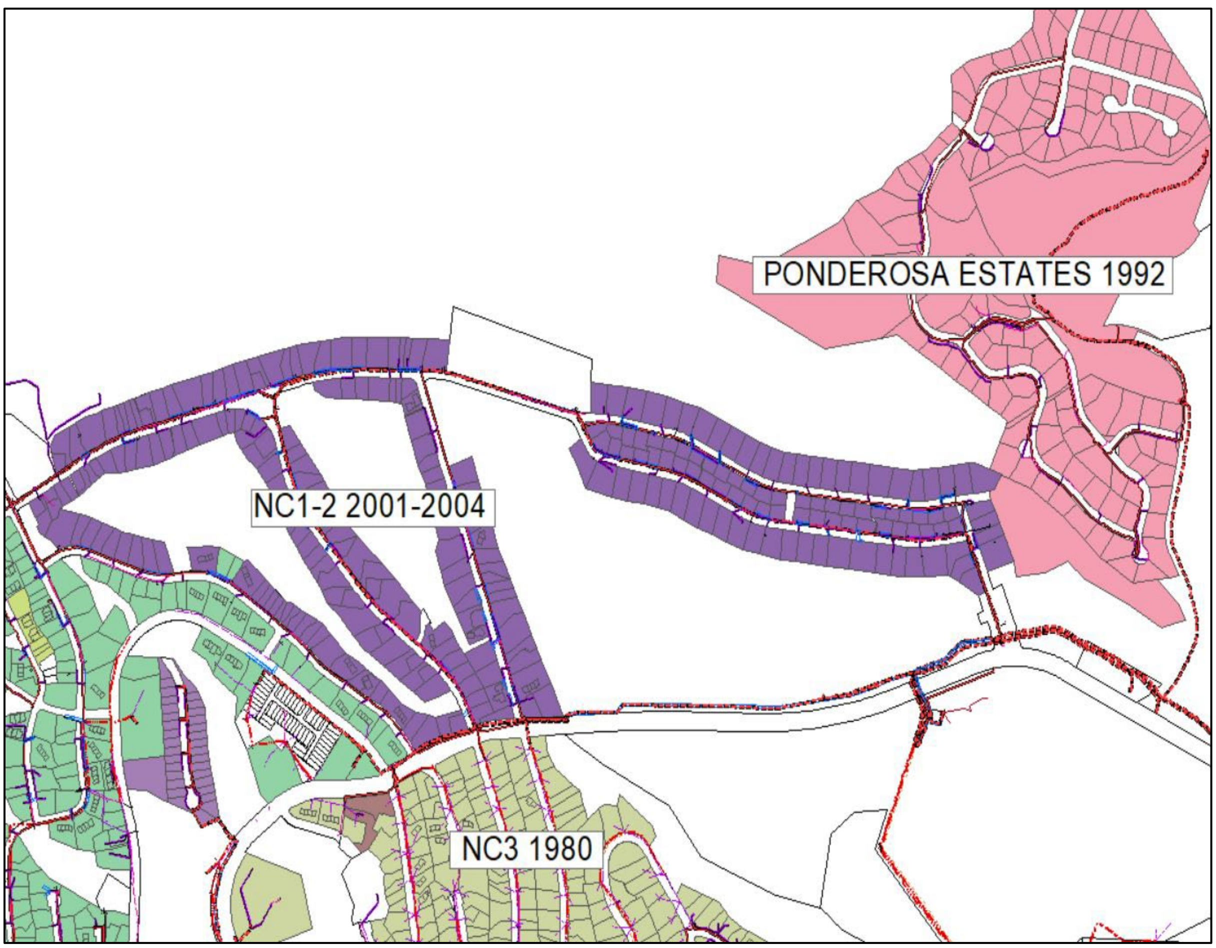
TO ALL LINE CREWS: ANY QUESTIONS ASK !!

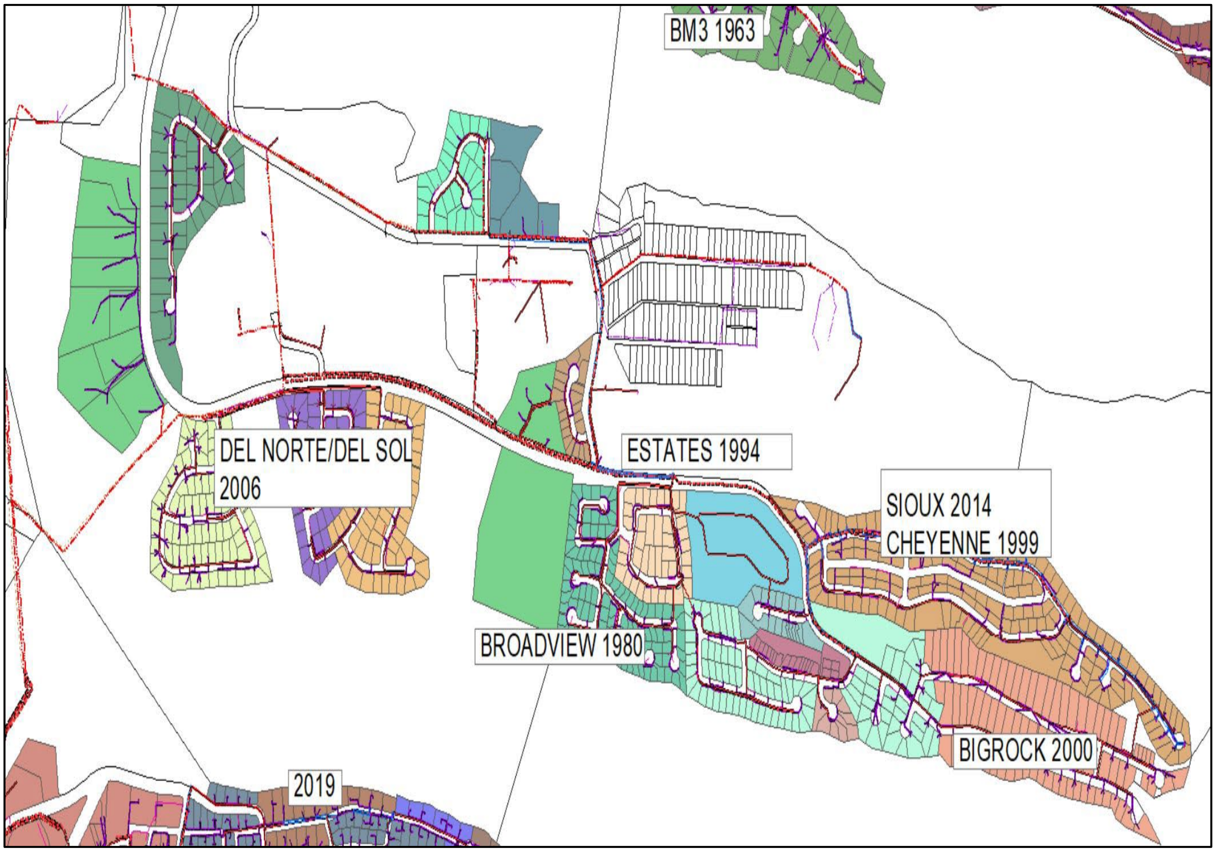
Appendix B:
SUBDIVISION MAPS WITH AGE






BM1 1961
BM2 1961
BM3 1965
BM4 1980
BM5 1980
BM5n 1978
BM3 1963


PONDEROSA ESTATES 1992
NC1-2 2001-2004
NC3 1980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2006
ESTATES 1994
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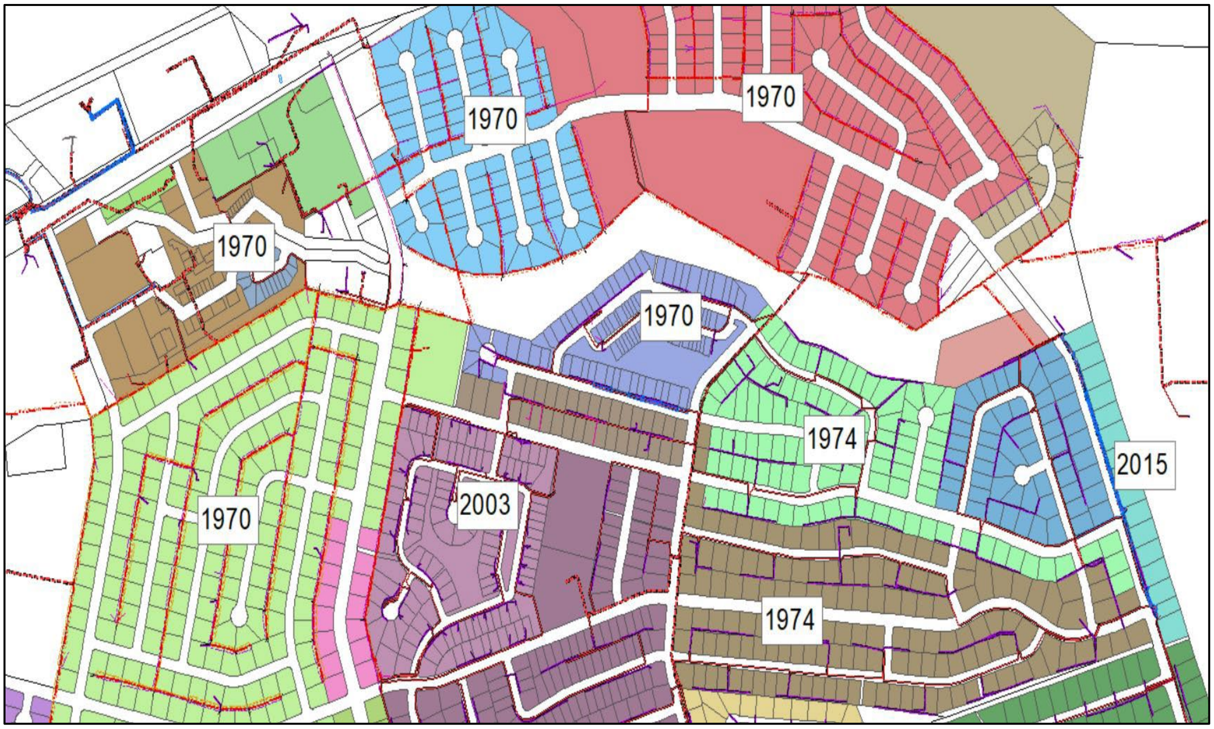
CHEYENNE 1999
BROADVIEW 1980
BIGROCK 2000
2019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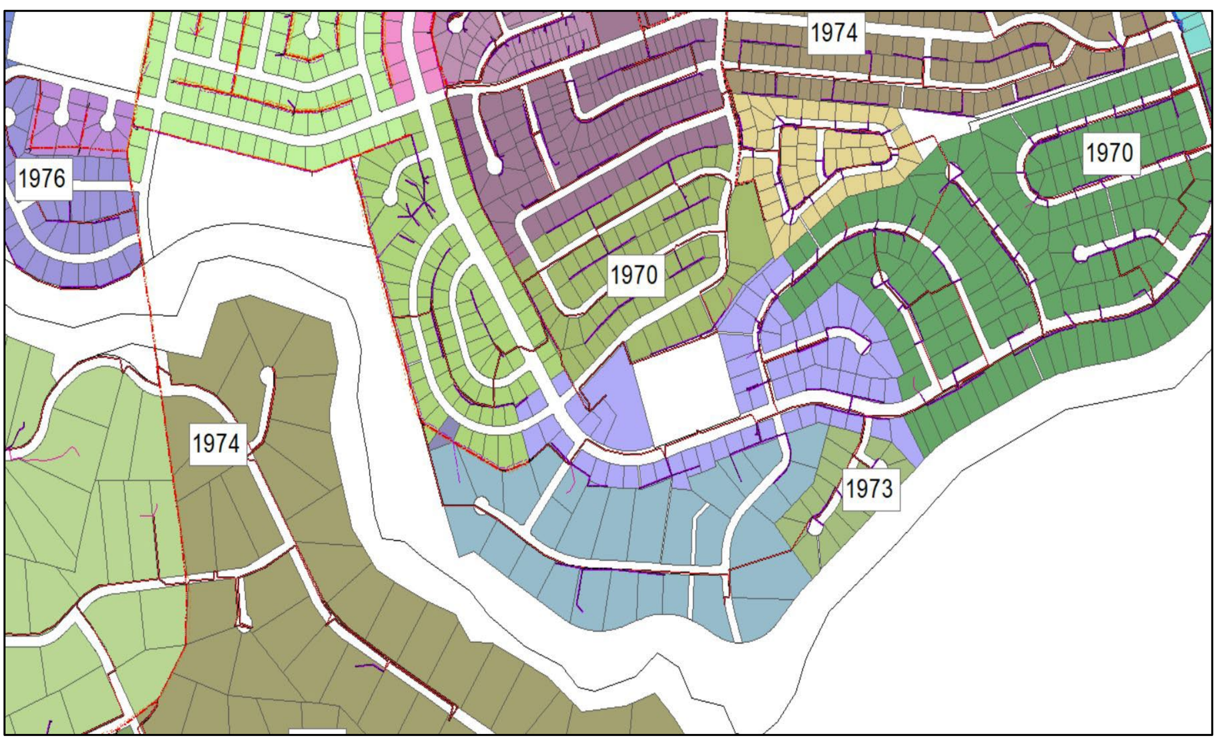
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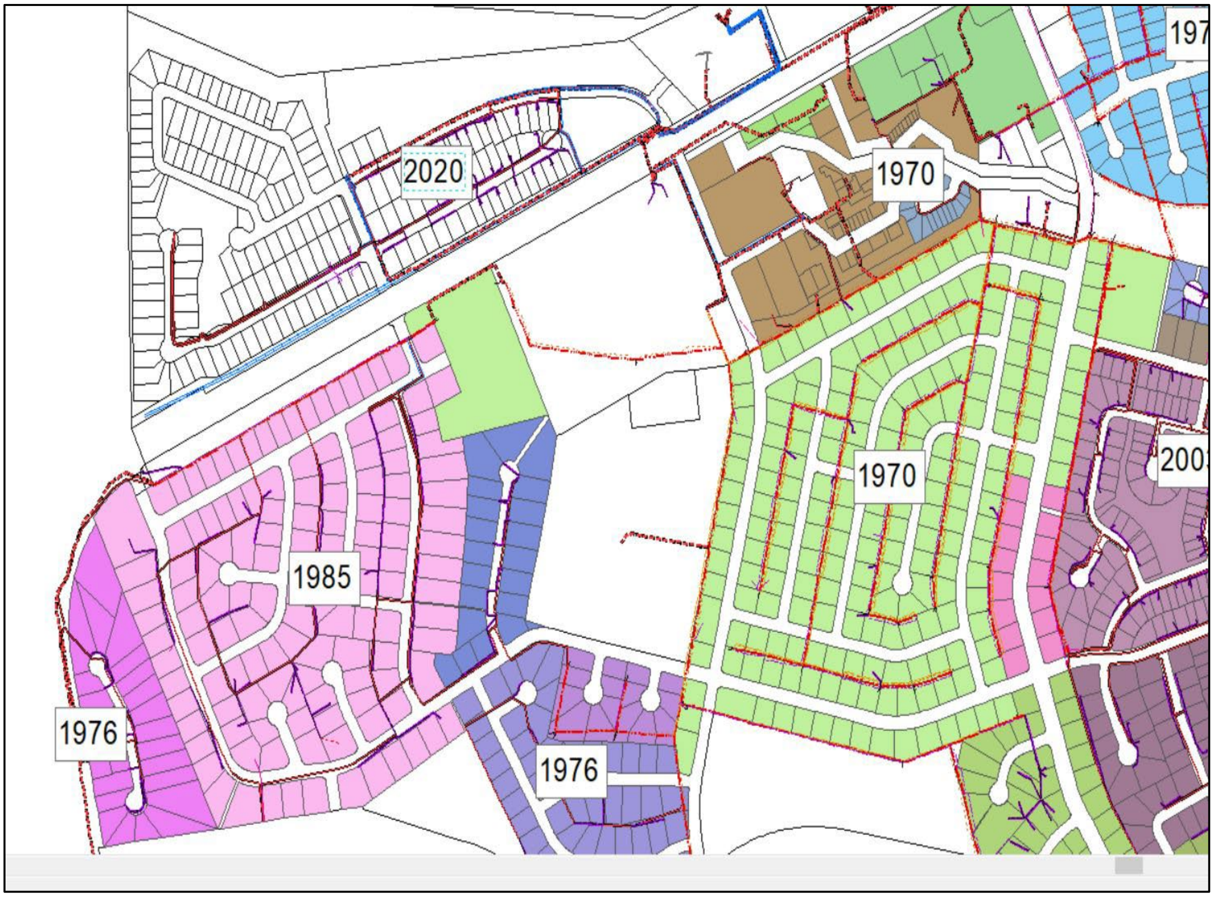
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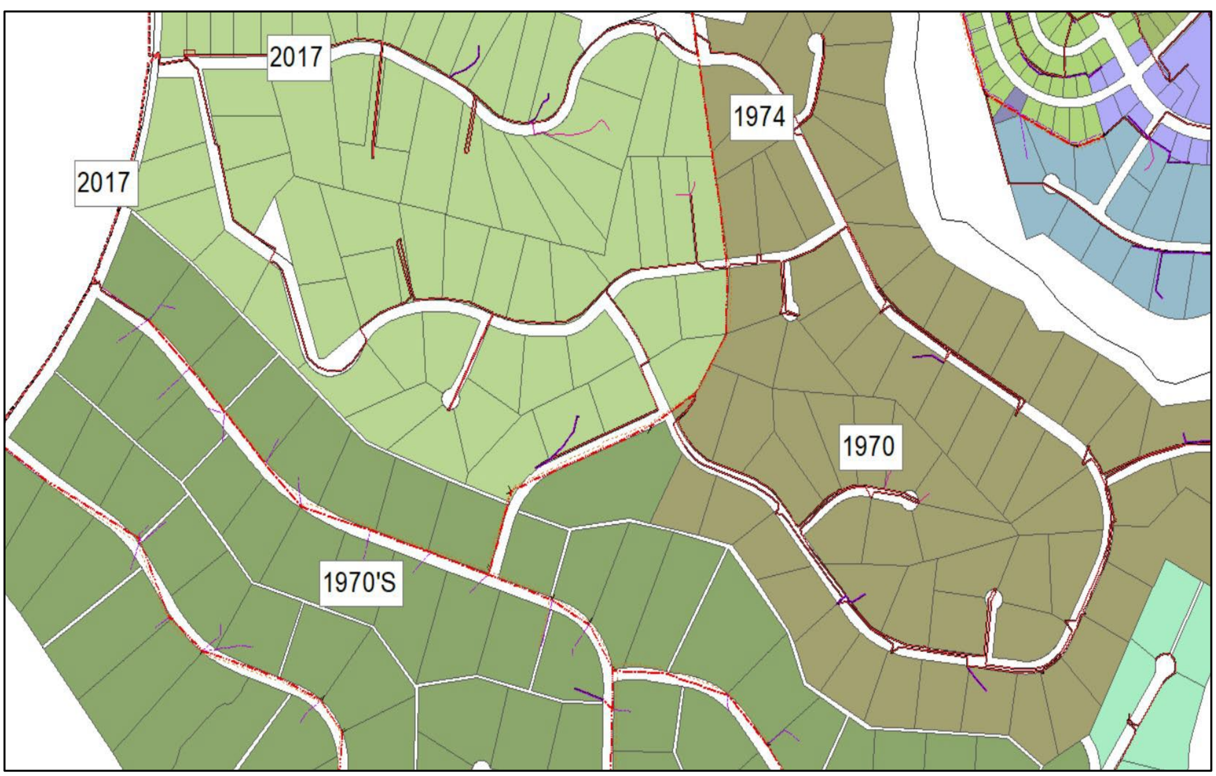
2017
2017
1974
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Appendix C
ASSESSMENT PRIORITY LIST

CIRCUIT-PRIORITY-RANK	DESCRIPTION
13-1-1	REPLACE 1000' 3 PHASE PRIMARY 500MCM FROM OPPENHEIMER TO TIMBER RIDGE
13-1-2	REPLACE 1000' 3 PHASE PRIMARY 1/0 CABLE ON OPPENHEIMER FROM TRINITY TO THE SOUTH
13-1-3	REPLACE 1000' 3 PHASE PRIMARY 500MCM FROM STATION TO OPPENHEIMER
13-1-4	REPLACE SWITCHES SC1305A, SC1309 AND SC1309A
13-1-5	NEED TO REPLACE TRANSFORMERS 725 AND 726
13-1-6	NEED TO RELOCATE TRANSFORMERS 1058, 1059 TO SIDEWALK
13-1-7	NEED TO REPLACE TRANSFORMERS 856 AND 857
14-1-1	REPLACE 15TH AND IRIS SWITCH SC1401A
14-1-2	REPLACE YMCA SWITCH SC1401A2
14-1-3	REPLACE YMCA TRANSFORMER #1117
14-1-4	REPLACE SOMBRILLO SWITCH SC 1404A AND REPLACE LINE TO NM502
14-1-5	REPLACE EASTGATE SWITCH T23201
14-2-1	REPLACEMENT OF TRANSFORMERS: 852,969,787,788,972,968,970,1117
14-2-2	SHANNON SWITCH INSTALL JUNCTION AND ROMOVE SC20505
14-2-3	REPLACEMENT OF SWITCHES SC1404A,1405,1406,1407,1406A,1408,1409,1406B,1410
15-1-1	REPLACE URD PRIMARY LINE FROM SYCAMORE TO PUEBLO COMPLEX
15-1-2	REPLACE SC1517 PMH9 AT QUEMAZON
15-1-3	REPLACE SC 1501A ON ROSE STREET
15-1-4	REPLACE SC1512 URBAN AT NORTH ROAD
15-1-5	INSTALL LOOP FEED FOR TOTAVI
16-1-1	INSTALL PRIMARY J-BOXES AT 897 & 921 ESTATES DR.
16-1-2	REPLACE PRIMARY CABLE IN LA MESA RRAILER PARK

16-1-3	INSTALL PRIMARY J-BOXES AT CORNER OF KRISTI LN AND BROADVIEW
16-1-4	INSTALL PRIMARY J-BOXES AT CORNER OF TIFFANY AND BROADVIEW
16-1-5	REPLACE 1 PHASE PRIMARY SECTIONS ON LOS PUEBLOS : 2000' TOTAL
16-2-1	REPLACEMENT OF SWITCHES 1603A, 1604,1605,1605A,1605B,1610
16-1-2	REPLACE PRIMARY CABLE IN LA MESA RRAILER PARK
17-1-1	REPLACE POLE #6152
17-1-2	REPLACE POLE #6154
17-1-2	REPLACE POLE 6137
17-1-3	REPLACE POLE #6138
17-1-4	REPLACE POLE # 6143
17-1-5	REPLACE POLE #6144
17-1-6	REPLACE POLE #6034
17-1-7	REPLACE POLE #6011
17-1-8	REPLACE POLE #6002
17-1-9	REPLACE POLE #6037
18-1-1	REPLACE SWITCH SC1803
18-1-2	INSTALL TRANSFORMER PAD AT MERRICK -
18-1-3	REPLACE OPEN DELTA TRANSFORMERS AT DP ROAD
18-1-4	REMOVE TRANSFORMER 1101 FROM MAIN TIE TO 18 AT DP ROAD
EA4-1-1	DESIGN AND REPLACEMENT
WR1-1-1	REPLACE 4 PADMOUNT SWITCHES ON ARAGON AVE.,WR3-3,WR3-4,WR3-5,WR3-6
WR1-1-2	CHANGE OUT TRANSFORMER P3631 AT DNCU MALL
WR1-1-3	CONDUCTOR REPLACEMENT LA SENDA AND PIEDRA LOOP
WR2-1-1	REPLACE CONDUCTOR VALLE DEL SOL