

Action Plans

**Focused Management and
Operations Audit of
Grayson Rural Electric
Cooperative Corporation**

Presented To:

*Kentucky
Public Service Commission*

Presented by:

*The
Liberty Consulting Group*

December 18, 2020

**1451 Quentin Rd Suite 400
#343
Lebanon, PA 17042**

admin@libertyconsultinggroup.com

Management Audit Action Plan

Recommendation No. 1

I. Report Reference

- A. Chapter II
- B. Section I. Field Practices
- C. Recommendation No. 1
- D. Priority: High

II. Recommendation Statement

Conduct trial retention of an arborist to assist with the vegetation management program.

III. Background

Grayson RECC has experienced lesser performance on a comparative basis, as measured against industry-typical reliability metrics. The large numbers of fallen off-ROW trees it experiences diminish its reliability performance as does its infrequent use of hot-line work, which increases the outages it needs to take to conduct many maintenance activities. Its high proportion of line lengths inaccessible by trucks also contributes to outage lengths.

Spending more to address off-ROW hazard trees and to keep pace with the eight-year vegetation management cycle offers material opportunities for improving reliability performance.

Grayson RECC uses consultants to assist it with electrical construction issues but does not utilize the services of a utility arborist consultant to assist with its vegetation management program. We find it typical, and often required, that an electric utility conduct vegetation management with the support of an International Society of Arboriculture (ISA) Certified Arborist Utility Specialist on staff or engaged as a consultant. Utility arborists have training and experience permitting them to lead or to assist in conducting vegetation management, including program management, ROW clearing, electric pruning, removing hazard trees, and storm response. They bring important knowledge about tree species, growth, diseases, conditions, and failures on and off power line rights of way. A certified utility arborist can provide Grayson RECC with utility-based guidance for ensuring that its vegetation management program and activities meet good utility practices and prove cost effective.

Grayson RECC should engage a certified utility arborist familiar with electric cooperatives, to conduct a study to examine management's vegetation management program, activities, and spending.

IV. Expected Improvement/Implementation Timeline

Fallen off-ROW trees contribute up to 50 percent of Grayson RECC circuit outages. Use of an arborist, experienced in vegetation management for electric utilities, will assist in determining the most cost effective practices generally, and provide expertise in identifying and removing likely off-ROW hazard trees. We do not conclude that Grayson RECC requires a full-time arborist or even on a part-time or consulting basis for more than an interim period. Management should contact other regional electricity providers (particularly larger ones) to assess the possibilities of a lending or sharing approach. Within two years, it should become clear whether the expected value justifies continuing use of an arborist, or whether knowledge transfer to internal staff has been sufficient.

Reliability improvement, rather than cost reduction, drives this recommendation. However, reducing outage incidents creates the possibility for generating savings, especially in reducing overtime costs. Grayson estimates the cost of an arborist at \$35 per hour, or \$280 per day. Management should arrange for the start of an arborist, either hired or made available for consultation by a larger regional electric utility, by April 2021.

We suggest a six-month (129 work day) contract starting in March or April 2021 as sufficient for an experienced utility arborist to review and report on Grayson RECC's vegetation program and field activities and to develop recommendations regarding improving efficiencies in the program, including:

- Addressing the 8-year vegetation management cycle
- Ways to reduce costs
- How to cost effectively address hazard trees
- Providing justified estimates for annual costs.

The arborist study should include

- Inspection of all ROWs for access, clearing, and tree contact issues
- Determination of the types of, and conditions of, vegetation (brush) and trees in or near the ROWs, especially the conditions and fall risk of off-ROW trees
- Review of management's vegetation management and tree removal practices
- Review of the management's ROW clearance, tree limb contact, and fallen tree reliability issues
- evaluation of the length of the 8-year cycle
- Evaluation of tree clearance and cutting and spraying contractor performances
- Development of an optimum hazard tree removal program (such treat pose the largest threat to reliability)
- Examination and evaluation of vegetation management costs
- Conclusions regarding the appropriateness of vegetation management practices and proposed cost increases
- Recommendations to improving the cost efficiencies and effectiveness of vegetation management and hazard tree removal.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

Grayson RECC reported that an arborist would cost \$280 per day. We would expect a higher rate, perhaps in the range of \$500 per day. The higher amount would produce a cost in the range of \$60,000 for the proposed retention period. Prompt action will be required to make an arborist available for work completion in 2021.

Grayson RECC spends over \$1.7 million each year for vegetation management (and expects that figure to increase to \$2.4 million annually). Expending \$60,000 or \$70,000 thus represents a very modest amount, requiring only very marginal reductions in annual vegetation management costs to justify it even on a cost basis.

B. Benefit Analysis

The arborist’s study should identify recommendations to improve the effectiveness of Grayson RECC’s vegetation management program effectiveness and provide guidance on removing hazard trees. It is not certain that the use of an arborist would identify future cost reductions.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> • \$60,000 to \$70,000 	<ul style="list-style-type: none"> • None
Benefit:	<ul style="list-style-type: none"> • Verifying optimum VM program design • Verifying appropriate VM costs 	<ul style="list-style-type: none"> • Improved VM efficiency • Possible reduced VM costs • Improved reliability

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Mike Martin

B. Title: Assistant Manager of Operations

C. Recommendation Action: Utilize a utility vegetation management specialist and/or arborist to facilitate improvements in Grayson’s vegetation management program in conjunction with reliability metrics

D. Explanation of Exception or Rejection: Grayson accepts the recommendation

VII. Utility Response (Filled Out By Company)

- A. **Discussion of Recommendation:** Grayson agrees that off-ROW trees are a key component in the outages that they are faced with and the subsequent effects they have on reliability indices and overtime costs. Approximately 25% of outages can be attributed to ROW related issues. This number has remained above 25% for the past two years and continues to be an issue.

Grayson's current practice is to cut 40-foot ROW clearance. In comparison to other cooperative's practice in the surrounding area, this practice is larger than others. Due to terrain and location of lines, even with a 40-foot clearance, hazard trees will continue to be an issue.

A thorough look at our current Vegetation Management plan would be beneficial to Grayson and to its' members. Any improvements and modifications that would provide a benefit to the Cooperative and to the members through decreasing costs and increasing reliability would be well served to explore and implement.

- B. **Improvement Proposed by Company:** Grayson proposes, as an initial step, to utilize a sister cooperative's vegetation management manager to review Grayson's practices and procedures and recommend any improvements that they observe to be beneficial. An agreement is currently in place for that to happen (initially scheduled for February but due to weather will be reschedule at the end of March or first of April).

Following their recommendations and implementation of improvements, Grayson will seek to continue the shared relationship or will look to contract their own arborist for guidance. Through discussions with other cooperative's management teams, a focus should be given to utilizing an arborist or individual who specializes in utility vegetation management and has the proper credentials related to the field.

In conjunction with the consultation and with strategic plan items discussed in relation to Grayson's Management Audit, a comprehensive and formal Vegetation Management plan will be updated, drafted and presented to the Board for their approval and will be reviewed on a yearly basis.

- C. **Discussion of Cost/Benefit Analysis:** Grayson agrees with the cost/benefit analysis presented by the Liberty Group. The opportunity to reduce the cost of the arborist is a possibility with an agreement or agreements with other cooperatives and utilizing their personnel in shared agreements.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Consult with Vegetation Management Specialist from sister cooperative to review current practices.	April 2021	April 2021
	Incorporate recommendations of previous review into current vegetation management plans	May 2021	Ongoing
	Determine if relationship is feasible to continue with utilizing/sharing personnel	May 2021	May 2021
	Continue process above or contract an arborist/utility vegetation management specialist to assist in program	May 2021	June 2021
	Develop, Review, and Approve an updated Vegetation Management Plan in conjunction with Strategic Plan goals	June 2021	December 2021

IX. Comments/Clarification of Intent

- A. Consultant Name: Mark Lautenschlager**
- B. Discussion**

Management Audit Action Plan

Recommendation No. 2

I. Report Reference

- A. Chapter II
- B. Section I Field Practices, Part 4 Vegetation Management
- C. Recommendation No. 2
- D. Priority: High

II. Recommendation Statement

Increase vegetation management activities sufficiently to meet the requirements of the eight-year cycle and implement an off-ROW hazard tree removal program.

III. Background (Filled Out By Consultant)

Continuation of management reductions in vegetation management expenditures will produce an activity rate that generates in practice a longer than 8-year cycle. The 8-year cycle has proven sufficient to maintain ROWs and limit tree limb contact-caused outages to a low level. However, off-ROW trees falling onto power lines have formed the primary contributor to reliability issues. Causing poor reliability was, which has not been formally addressed.

Management proposed increasing its annual budget from \$1.7 million to \$2.4 million to maintain the 8-year cycle. It is not clear that an increase of this magnitude will prove necessary, depending on the results of the arborist study we recommend. The need for funding increases should await the base work of the arborist, which management should complete promptly. Completion will provide a sounder foundation for assessing continuing vegetation management needs and associated resources and costs.

IV. Expected Improvement/Implementation Timeline

Contacts from trees and brush have not contributed substantially to outages, indicating vegetation management brush and tree trimming effectiveness in past years. However, the very substantial 2020 decrease in vegetation management activities and expenditures appears too large to be sustainable, if continued. It is important for management both to set optimum cycles and then to commit the expenditures needed to accomplish the work required to meet them. Moreover, we see a need for increased off-ROW hazard tree removal - - the primary cause of outages here. We recommend a formal off-ROW hazard tree removal program, focused on most effectively identifying and removing those trees most likely to fall into lines. Management needs to examine its cycle and increased hazard tree removal, to ensure that it will optimize expenditures, without necessarily increasing them.

This recommendation seeks reliability improvement, rather than cost reduction. However, increased hazard tree removal need not necessarily add to total costs. Working with the arborist, cycle changes for routine vegetation management may prove possible, particularly given the lack of contact (as opposed to falls) from trees and brush as a material source of interruptions under historical practice and expenditure levels. Incorporating hot-spot trimming may also assist in more refined tailoring of regular cycles to correspond to the variety of vegetation conditions across the service territory.

Management should revisit plans to increase vegetation management spending post-2020 to \$2.4 million per year (from an historic base of \$1.7), following engagement of an arborist and completion of the recommended study.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

This recommendation will operate in concert with the first one, requiring marginal costs of \$60,000 to \$70,000 for engaging an arborist. Some increase above 2019 expenditures of \$1.7 million are necessary on a base level, added to which will be the costs of off-ROW hazard tree removal.

B. Benefit Analysis

A redesigned base program employing the experience of an arborist will better inform future vegetation management activities and associated costs. Whatever amounts are spent will be better directed at the vegetation-related drivers of interruptions, thus improving reliability, or at least maintaining it at a lower cost.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> Until study is completed 	<ul style="list-style-type: none"> TBD
Benefit:	<ul style="list-style-type: none"> When study is completed, verifying appropriate VM costs, and confirming optimum VM program 	<ul style="list-style-type: none"> TBD

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Mike Martin

B. Title: Assistant Manager of Operations

C. **Recommendation Action:** Construct a comprehensive Vegetation Management Plan that focuses on increase reliability and proper maintenance of Grayson’s infrastructure and ROW

D. **Explanation of Exception or Rejection:** Grayson accepts recommendation proposed

VII. Utility Response (Filled Out By Company)

A. **Discussion of Recommendation:** Grayson agrees that an aggressive vegetation management plan that has a focus on off-ROW trees is a necessary component for maintaining reliability of service. Cost becomes a prohibitive factor that management must balance when deciding on the maintenance route to take

In 2019, 1.79 million dollars was spent on ROW expenses. 1.81 millions dollars was budgeted for 2020, however, due to the Covid-19 pandemic and staffing issues with our ROW crews, spending decreased to 1.57 million dollars. 2021 budgeted dollars for ROW expenses remained at 2020 levels and increased to 1.83 million in 2021.

Grayson is in favor of maximizing its monetary expenses towards its vegetation management program that achieves increased reliability without increasing cost to its’ members.

B. **Improvement Proposed by Company:** Review of Grayson’s vegetation management program should be the first step in achieving its goals through the recommendation. Based on the review and input from the arborist and in conjunction with Recommendation 1, a formal Vegetation Management plan should be updated and presented to the Board for their approval, with a focus on off-ROW trees and improving reliability.

C. **Discussion of Cost/Benefit Analysis:** Ideally, maximization of current practices while shifting costs would be the goal of the proposed improvement. Any additional spending would have to be scrutinized through the budget process.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Utilize feedback from studies in Recommendation 1 to make necessary changes in ROW Program	April	Ongoing
	Budget accordingly during budget review process to incorporate feedback and changes produced from Recommendation 1.	October	December

IX. Comments/Clarification of Intent

- A. **Consultant Name:** Mark Lautenschlager
- B. **Discussion**

Management Audit Action Plan

Recommendation No. 3

I. Report Reference

- A. Chapter II
- B. Section F. Reliability
- C. Recommendation No. 3
- D. Priority: Medium

II. Recommendation Statement

Increase the use of “hot-line” work by internal lineworkers to reduce outages taken to perform maintenance activities.

III. Background

Grayson RECC’s performance as measured against industry-typical reliability metrics is comparably low. The large numbers of fallen off-ROW trees it experiences diminish its reliability performance and its low use of hot-line work requires outages for many maintenance activities. A high proportion of line inaccessible by truck also contributes to outage lengths at Grayson RECC.

Management lists “Maintenance” as the cause for about 13 percent of CAIDI. Management has trained some line workers in methods, procedures, and safety practices required for working on energized lines. Management should extend training to all its line workers to permit all to practice hot-line work. This measure would improve CAIDI and would reduce costs for contractors, who now normally perform hot-line work on the system.

IV. Expected Improvement/Implementation Timeline

The goal is to improve CAIDI, but implementation could produce a small reduction in contractor costs as well. Marginal additional training costs are all that is required to enable all Grayson RECC line workers to work on energized circuits. Management should train and prepare all lineworkers for hotline work, and begin conducting hotline work by Spring 2021.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

We estimate a need for two days of hot line training for all 14 lineworkers, producing a costs of less than \$20,000 including instructor and lineworker hourly rates.

B. Benefit Analysis

Using internal lineworkers will reduce line contractor costs, as well as reducing CAIDI caused by maintenance outages.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> \$20,000 	<ul style="list-style-type: none"> \$2,000 (for retraining)
Benefit:	<ul style="list-style-type: none"> Reduced contactor costs Improved CAIDI 	

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Kyle Clevenger

B. Title: Manager of Operations

C. Recommendation Action: To implement a training and safety program that would allow for Grayson RECC to perform hot line work.

D. Explanation of Exception or Rejection: Grayson agrees with the recommendation with the exception of the one time cost and time line for completion and implementation. Due to safety equipment needed, the one time cost would increase an additional \$30,000. Meeting the training requirements necessary to begin utilizing hot-line work for all employees would take additional time outside of Spring 2021.

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation: Hot-line work would provide Grayson the opportunity to increase its reliability, decrease overtime costs, and provide the opportunity to reduce contractor costs.

Currently, all maintenance on lines completed by Grayson RECC requires an outage to perform. While certain outages are unavoidable regardless if linemen are trained to complete hot-line work, those that could be completed safely while still energized are being completed by the contractor or requiring an outage, thus affecting reliability indices.

A training and safety plan would ultimately need to be developed and approved before hot line work could begin. Additional training and experience would be necessary before all employees would be capable of safely completing the work.

B. Improvement Proposed by Company: Grayson will discuss with other cooperative operation managers and safety instructors to determine the necessary training requirements to ensure that all employees are safely trained to complete hot-line work. In conjunction with KEC statewide safety instructors, a training plan will be developed and implemented before hot line work begins.

Requirements of safety equipment, training, and supervised work from experienced personnel would be included in the plan. Completion of the program would be required before hot-line work could begin.

C. Discussion of Cost/Benefit Analysis: Additional costs of \$30,000 should be expected due to purchase of necessary safety equipment to complete hot line work. Continuous training should be provided as a service from statewide association and would limit any recurring costs to the purchase of safety equipment.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Purchase safety equipment necessary to complete hot-line work	January 2021	March 2021
	Develop training program with guidelines on achieving certificate to complete hot-line work	January 2021	April 2021
	Begin training program	May 2021	Ongoing
	Hot-line work utilized	May 2021	Ongoing

IX. Comments/Clarification of Intent

- A. Consultant Name:** Mark Lautenschlager
- B. Discussion**

Management Audit Action Plan

Recommendation No. 4

I. Report Reference

- A. Chapter II
- B. Section F. Reliability
- C. Recommendation No. 4
- D. Priority: Medium

II. Recommendation Statement

Provide a structured program for conducting and documenting work activities addressing work on the previous year's worst performing circuits, including follow up inspections and corrective maintenance conducted, and estimated or actual reliability improvements.

III. Background

Management does not focus on reporting and assessing the effectiveness of work conducted to improve the reliability of its worst-performing circuits. It does address them regularly, but does not use the increasingly prevalent practice of formally analyzing cost and performance change data following work on those circuits, in order to identify most effective measures and results.

IV. Expected Improvement/Implementation Timeline

Structured, highly visible worst-circuit programs have become common in optimizing efforts to enhance reliability performance. To ensure that the causes of outages on these circuits are addressed and to optimize expenditures on them, management should annually catalogue efforts and costs to investigate the causes of outages, corrective actions taken, and estimated reliability improvements (e.g., avoided customer interruptions and numbers of customers interrupted each year, or improvements in SAIFI and CAIDI, for each of the previous year's worst performing circuits).

This recommendation seeks to improve reliability by addressing the worst performing circuits, but will also optimize reliability gains for the money spent. Adopting and implementing the program should involve no material cost. Management should by January 2021, begin documenting all identified causes of outages occurring for the previous year's worst performing circuits, document corrective actions and costs applied during the year, and estimate the reliability improvement resulting those corrective actions.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

No additional costs.

B. Benefit Analysis

Implementation will enable management to identify and report the work, *e.g.*, adding reclosers, fuses, replacing insulators, cross arms, poles, or conductor, specifically undertaken on the worst performing circuits, the cost of that work, and the estimated numbers of customer interruptions (CIs) or customer minutes of interruption (CMI) avoided each year, or SAIFI and CAIDI improvements, because of the reliability work and improvements. The data collected and analysis performed will provide a tool for prioritizing worst performing work and improvements and for determining reliability value gained for dollars expended under each of the methods applied to the circuits involved.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None
Benefit:	<ul style="list-style-type: none"> • Provide a means to verify worst performing work was done, what it was, what it cost, and measuring the cost to avoided CIs and CMIs • Improved SAIFI and CAIDI 	

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Brian Poling/Kyle Clevenger

B. Title: Manager of Technical Services/Manager of Operations

C. Recommendation Action: To document and provide explanations of work that is completed on worst performing circuits

D. Explanation of Exception or Rejection: Grayson agrees with recommendation

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation: Grayson understands the importance of maintaining reliable service, measures by reliability indices such as CAIDI and SAIFI. Since 2017, Grayson has seen improvement in its indices as seen in the table below.

Year	SAIFI (#)	CAIDI (Minutes)	SAIDI (Minutes)
2017	3.7	148	545
2018	3.0	125	378
2019	2.6	147	381
2020	2.5	136	338

To assist in maintaining acceptable reliability standards, Grayson should focus on its worst performing lines and document the steps taken to ensure that significant issues are being addressed and progress is being made.

While Grayson does address its worst performing circuits, it has not in the past documented and provided explanations on what has been to achieve these improvements.

- B. Improvement Proposed by Company:** Grayson will develop a report that can be submitted to the Commission at its request that will document the necessary steps taken to address the worst performing circuits.

- C. Discussion of Cost/Benefit Analysis:** Additional costs should not be incurred by Grayson through the implementation of this recommendation, as costs associated with improvements would already have incurred through corrective action.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	From the Reliability report submitted to the PSC annually, document all preventive and corrective measures on the worst performing circuits.		
	Submit documentation to the Commission regarding the corrective and preventive measures taken on previous years worst performing circuits when completing Annual Reliability Report.		

IX. Comments/Clarification of Intent

- A. Consultant Name:** Mark Lautenschlager

B. Discussion

Management Audit Action Plan

Recommendation No. 5

I. Report Reference

- A. Chapter II
- B. Section F. Reliability
- C. Recommendation No. 5
- D. Priority: Medium

II. Recommendation Statement

Conduct a structured annual training program for properly identifying outages and require reporting intended to reduce “unknown” as the cause of outages.

III. Background

Management has been working with its maintenance lineworkers to reduce the number of outage causes listed as “unknown.” Outages attributed to unknown causes accounted for about 8 percent of system-wide outages in 2019, with at least one circuit having 21 percent of its causes attributed to unknown causes.

IV. Expected Improvement/Implementation Timeline

Management should formalize its training for identifying causes so that the engineering chiefs and the manager of operations can address the causes of outages. The goal is to improve reliability. Implementation will require only nominal costs. By April 2021, management should be operating a formal outage-cause identification training program encouraging and preparing all lineworkers to investigate the causes, or the most likely causes of all outage causes. The training should give them sufficient ability to identify outage causes and an understanding of the importance of accurate outage data.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

Training for demonstrating the importance of, and the methods for identifying the most likely causes of outages should require about day for management to develop. Lineworker training can be part of periodic safety training. No additional costs should be incurred.

B. Benefit Analysis

Listing outage causes as unknown hinders investigation and correction of them individually. It can also produce misunderstanding about the relative contributions of major causes, which can affect the locations and emphases on which management focuses its planning and budgeting. Reducing reported unknown causes allows the engineering chiefs, and others, to address those causes both individually and with respect to what causes are the principal drivers of outages across the system.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> \$0
Benefit:	<ul style="list-style-type: none"> Improved Reliability 	

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Kyle Clevenger

B. Title: Manager of Operations

C. Recommendation Action: Developing and implementing a continuous training program that focuses on identifying and documenting outage causes while reducing the amount of unknown to a minimum

D. Explanation of Exception or Rejection: Grayson accepts the recommendation

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation: Documenting outage causes is an important part of ensuring and improving reliability to Grayson’s members. Excessive use of unknown causes does not provide the proper feedback and allow for management and their teams to ensure proper improvements and maintenance occurs.

Proper education and training is essential to provide the front line worker the tools they need to accurately assess the situations and provide the proper feedback needed.

Grayson has already conducted training sessions through their safety program on the importance of proper documentation with outages. As you can see from our data, unknown outages have dropped from 162 in 2018 to 118 in 2019 and 23 in 2020.

B. Improvement Proposed by Company: Grayson plans to continue their education of proper outage determination through their safety trainings in-house and in conjunction with the statewide safety program.

Grayson will also continue to monitor their outage codes and causes and will utilize the data to propose changes or improvements to their operational goals and work flow.

- C. Discussion of Cost/Benefit Analysis:** Grayson agrees that outside of any special training for special situations, there should be no cost associated with the continued training and a benefit of increased reliability through the system.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Continue and Incorporate periodically safety presentations that regard to outages and the importance of correct documentation and determination factors.	January	Ongoing
	Facilitate with KEC Safety program an annual safety presentation regarding outages and cause reporting.	January	Ongoing
	Review outage data with management team and when necessary the Board of Directors and determine proper course of action to improve any outlying numbers.	April	Ongoing

IX. Comments/Clarification of Intent

- A. Consultant Name:** Mark Lautenschlager
B. Discussion

Management Audit Action Plan

Recommendation No. 6

I. Report Reference

- A. Chapter II
- B. Section H. Field Operation, Part 3 Field Labor Costs
- C. Recommendation No. 6
- D. Priority: High

II. Recommendation Statement

Evaluate and take actions to optimize lineworker overtime levels, considering the need to support maintenance of reliability performance.

III. Background

Grayson RECC lineworkers worked 3,973 overtime hours in 2019, producing a total cost of approximately \$270,000 for overtime maintenance work. Rates have fallen some recently, but remain at a comparatively high percentage of regular hours.

IV. Expected Improvement/Implementation Timeline

Grayson RECC has charged all lineworker overtime to maintenance work, with none to construction work since 2017. Much maintenance overtime likely results from addressing off-hours outages and restoring power to end users. However, management should identify where it can delay or make temporary outage restorations, permitting repairs during regular time hours. Management's review should identify any other areas it can reduce or eliminate maintenance overtime. This study should include considerations for CAIDI consequences of these actions.

Before management secures a fuller understanding of the drivers of overtime levels, savings estimates remain speculative. However, the recommendation will lead to a determination of how to best manage overtime use as part of its resource mix. The analysis should involve no material incremental costs. Management should complete by March 2021 a study of overtime drivers with conclusions about where lineworker overtime hours can be reduced in the future, without substantially affecting reliability.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

Conducting the overtime reduction study in-house should require no appreciable incremental costs.

B. Benefit Analysis

Reducing overtime costs reduces the RECC's costs that go into the consumer rates. After the study is completed, management should set reasonable reduction goals, and plan work accordingly.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
Benefit:	<ul style="list-style-type: none"> Up to \$270,000 per year 	

D. Other Costs or Benefit

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Bradley Cherry

B. Title: Interim President & CEO

C. Recommendation Action: Conduct a study to evaluate overtime with Grayson RECC's lineworkers and develop a framework to potentially reduce overtime hours while not causing a negative change in reliability indicies.

D. Explanation of Exception or Rejection: Grayson accepts Liberty's recommendation

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation: Grayson fully understands the effect that an excessive number of overtime hours has on its' members. Increased maintenance expenses passed on to members through rates and negative reliability indices are directly related to high overtime hours. While maintenance overtime hours will never be eliminated, an ability to reduce or control the hours would greatly benefit Grayson and its' members.

In order to plan and make the necessary changes to improve in this matter, a framework will need to be developed to assist in monitoring and evaluating overtime hours. Once developed, this framework would be utilized in determining causes as well as managing the appropriate steps necessary to manage currently and in the future.

Additional policies could potentially be developed in order to assist and properly determine the course of action necessary to take in maintenance situations. Reliability and safety will remain a key component in all changes and decisions made.

B. Improvement Proposed by Company: Grayson will develop a framework to document and analyze all overtime hours. From this analysis, Grayson will determine the proper procedures to address potentially reducing overtime hours by delaying overtime maintenance work.

Grayson through its data analysis, could also determine that potential corrective maintenance be scheduled to reduce the opportunity of overtime maintenance on lines that potentially face issues.

C. Discussion of Cost/Benefit Analysis: Grayson agrees with Liberty’s cost/benefit summary. Any additional cost occurred through corrective maintenance would be offset by reduction of future overtime hours or construction hours.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Development of model to determine key data points necessary for analysis.	December	January
	Utilization of model and analysis of data	March	Continuous
	Periodic discussion of data and necessary changes in procedures moving forward	March	Monthly
	Review overtime hours and report to necessary parties (Management/Board/PSC)	March	Monthly
	Schedule of corrective maintenance as needed	March	Monthly

IX. Comments/Clarification of Intent

A. Consultant Name: Mark Lautenschlager

B. Discussion

Management Audit Action Plan

Recommendation No. 7

I. Report Reference

- A. Chapter II
- B. Section H. Field Operations, Part 2 Resources and I. Field Practices, Part 3 Restoration and Retirement
- C. Recommendation No. 7
- D. Priority: High

II. Recommendation Statement

Engage, initially on a trial basis, a professional ground-line pole testing and treating contractor.

III. Background

A common utility practice plans replacement of wood poles when they have lost 50 percent of their original strength. Ground line inspection and testing comprises the only reliable way to determine pole strength quantitatively. The process also includes injection and wrapping measures designed to extend expected pole life to 60 years or more. Grayson RECC uses the significantly less accurate method of sounding (thumping with a hammer) poles to detect internal voids, conducted as part of its two-year circuit inspection cycle. We do not consider this procedure alone as an effective in determining when to replace poles.

The lack of a sounder approach creates risk that management is replacing poles unnecessarily, or not addressing poles that should be replaced. A companion issue arises from the large number of poles (about one-third of the total) of indeterminate age, as addressed in Recommendation No. 8.

IV. Expected Improvement/Implementation Timeline

Reducing the rate of pole replacement can produce material savings by requiring fewer construction lineworkers. Management estimated, based on conducting ground-line inspection on about 2,253 poles each year (1/10 of all poles known to be older than 20 years old, plus those poles with unknown age) that the annual cost would be in the range from \$90,000 for the ground-line inspection plus fungicide to about \$126,000 if insecticide was included. This cost may be reduced if management can determine the age of its poles of unknown age. Management should institute a trial pole ground-line testing program by April 1, 2021.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

Management determined that the maximum cost could be \$126,000 per year. However, changing the 10-year cycle to 15 years would reduce costs to \$10,000.

B. Benefit Analysis

Wood poles should last about 60 years, unless ground conditions, moisture, and insects have caused internal deterioration. The best way to identify this deterioration is to bore the pole above and below the ground line, and measure shell thickness. Grayson RECC construction lineworkers spend a large portion of their time replacing poles that maintenance line workers had determined as bad by inspection and thumping. Management budgeted about \$1.4 million in 2021, and \$1.5 million in 2022, at about \$4,500 per pole for replacing poles. The goal of this program is to reduce the numbers of poles replaced, or at least ensuring that only poles rejected by professionally trained inspectors are replaced.

Grayson RECC has already replaced about 4,000 poles since 2010. As the pole testing and treatment program progresses, fewer poles should be identified for replacement.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> \$80,000 to \$126,000
Benefit:	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Possibly fewer poles replaced at \$4,500 per pole Pole life extended by treatment

D. Other Costs or Benefits

None identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Robert Brown

B. Title: GIS Technician

C. Recommendation Action: Implement a ground-line pole testing program to facilitate proper maintenance and replacement of critical infrastructure.

D. Explanation of Exception or Rejection: Grayson accepts the recommendation

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation:

- B. Improvement Proposed by Company:** Grayson will implement a pole testing program that utilizes testing at the ground level while determining any sort of corrective action that may need to take place.

After selecting a contractor to facilitate the pole testing program, Grayson will utilize their service to assist in determining the replacement of poles on its system as well as allowing for treatment to take place at the pole to help ensure the longevity of the structure as well as assisting in reducing costs from unnecessary pole changes.

- C. Discussion of Cost/Benefit Analysis:** Grayson agrees that the benefit of the program could lead to fewer poles being changed as well as longevity of the poles and their structures. Costs associated will be better understood once formal quotes are received. An ongoing review, at minimum on a yearly basis, should be completed to ensure that the cost benefit of the program is a savings for the cooperative.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Solicit bids on performing pole testing program	March 2021	April 2021
	Select contractor	April 2021	May 2021
	Begin Pole Testing Program	May/June 2021	Ongoing
	Review progress and effectiveness of Program	December 2021	Ongoing

IX. Comments/Clarification of Intent

- A. Consultant Name:** Mark Lautenschlager

- B. Discussion**

Management Audit Action Plan

Recommendation No. 8

I. Report Reference

- A. Chapter II
- B. Section U. Field Practices, Part 3 Restoration and Retirement
- C. Recommendation No. 8
- D. Priority: Medium

II. Recommendation Statement

Investigate the ages of poles with unknown ages.

III. Background

A companion issue to the ground-line pole testing program (Recommendation No.7) arises from the large number of poles (about one-third of the total) of indeterminate age.

About one-third of the RECC’s poles do not have the manufacturer’s date marks required to determine pole age. If management determined the install dates of these poles, then it can determine whether to include those poles in the ground-line pole testing and treatment program. Management indicated that it may not be possible to date all of these poles. However, management should research its records to identify likely install dates.

IV. Expected Improvement/Implementation Timeline

The number of wood poles known to be over 30 years is not large, but management does not know the age of almost a third of its poles due to label fading. Management should endeavor to determine the age of the poles of unknown age. A program that reduces this number substantially may produce a reduction in the numbers of poles tested each year. Researching pole age should not produce material marginal costs. If research does not provide management with pole ages by April 1, 2021, then ground-line pole testing should include the provision of age estimates.

V. Cost/Benefit Analysis and Support

A. Cost Analysis

No additional costs.

B. Benefit Analysis

Identifying pole age may reduce the numbers of poles included in the ground-line pole testing and treatment program.

C. Cost/Benefit Summary

Category	One Time	Annual Recurring
Cost:	• None	• None

Benefit:	<ul style="list-style-type: none"> • Reduce cost of pole testing program 	

D. Other Costs or Benefits

None Identified.

VI. Utility Responsibility (Filled Out By Company)

A. Name: Robert Brown

B. Title: GIS Technician

C. Recommendation Action: To determine the age of unknown poles located on Grayson’s system to assist in the pole testing program

D. Explanation of Exception or Rejection: Grayson agrees with the recommendation

VII. Utility Response (Filled Out By Company)

A. Discussion of Recommendation: In 2015, Grayson began a project that allowed it digitally map its system for the first time. During this process, all poles were given a unique pole identifier number and data was collected on each point that contained the makeup of the pole and all of its material, attachments, and the age of the pole.

During the progress, a significant portion of the poles that were on the system had their date marking become unreadable, mostly due to weather. When the contractor could not read the date stamp, they were marked as unknown. Because this was the first time a unique identifier was referenced to each individual pole and not just a Grayson tag, it has become nearly impossible for Grayson to determine the age of the majoring of the unknown poles.

When speaking with possible contractors for the pole testing program, Grayson inquired about the possibility of accurately identifying the age of poles before testing. The response was greatly that they could try, but it would be likely that accurately determining the age of the poles would be difficult.

- B. **Improvement Proposed by Company:** In conjunction with Recommendation 7, Grayson will utilize its pole testing program to assist in determining the age of any unknown poles. For any poles that a contractor can accurately determine their age, it will be noted and updated in the system. Otherwise, testing and documentation of the pole as is will have to be incorporated
- C. **Discussion of Cost/Benefit Analysis:** Any poles that can be identified would only benefit the over GIS system and its data outputs, as well as possibly eliminating the need to test those pole, providing additional opportunity to test and treat other poles. Grayson agrees there should be no additional costs, only the benefits of avoiding testing unnecessary poles and being able to test and treat more poles that need it.

VIII. Implementation Steps (Filled Out By Company)

Recommendation No.	Implementation Steps	Start Date	Completion Date
	Solicit contractor of pole testing program to assist in determining age of pole as applicable	May 2021	Ongoing

IX. Comments/Clarification of Intent

- A. **Consultant Name:** Mark Lautenschlager
- B. **Discussion**