Contents: Atchison-Holt Electric

Section 1: Introduction

Atchison-Holt Electric Cooperative (AHEC) was established in 1938 to provide electric service to the rural areas of northwest Missouri. A Touchstone Energy Cooperative, AHEC is headquartered in Rock Port, Missouri, and provides service to customers in Atchison, Holt, and Nodaway counties in Missouri as well as three counties in Iowa and Nebraska. The cooperative is run by a board of nine directors which approve the company's mission and internally developed business policy:

"Atchison-Holt Electric Cooperative is dedicated to providing our members with a reliable, competitively-priced, high quality supply of electric energy, while adhering to cooperative principles and striving to improve the quality of life for all members through a highly trained, efficient staff."

AHEC's service boundaries within the state of Missouri include Atchison and Holt counties in their entirety as well as the western portion of Nodaway County. The cooperative owns 888 miles of service line within these counties. Figure 1 depicts the geographic boundaries of the cooperative in relation to USGS local quadrangles within the state of Missouri. *(Map sources: www.usgs.gov, Association of Missouri Electric Cooperatives, Atchison-Holt Electric Cooperative.)*

Figure 1 *AHEC Cooperative Boundaries*

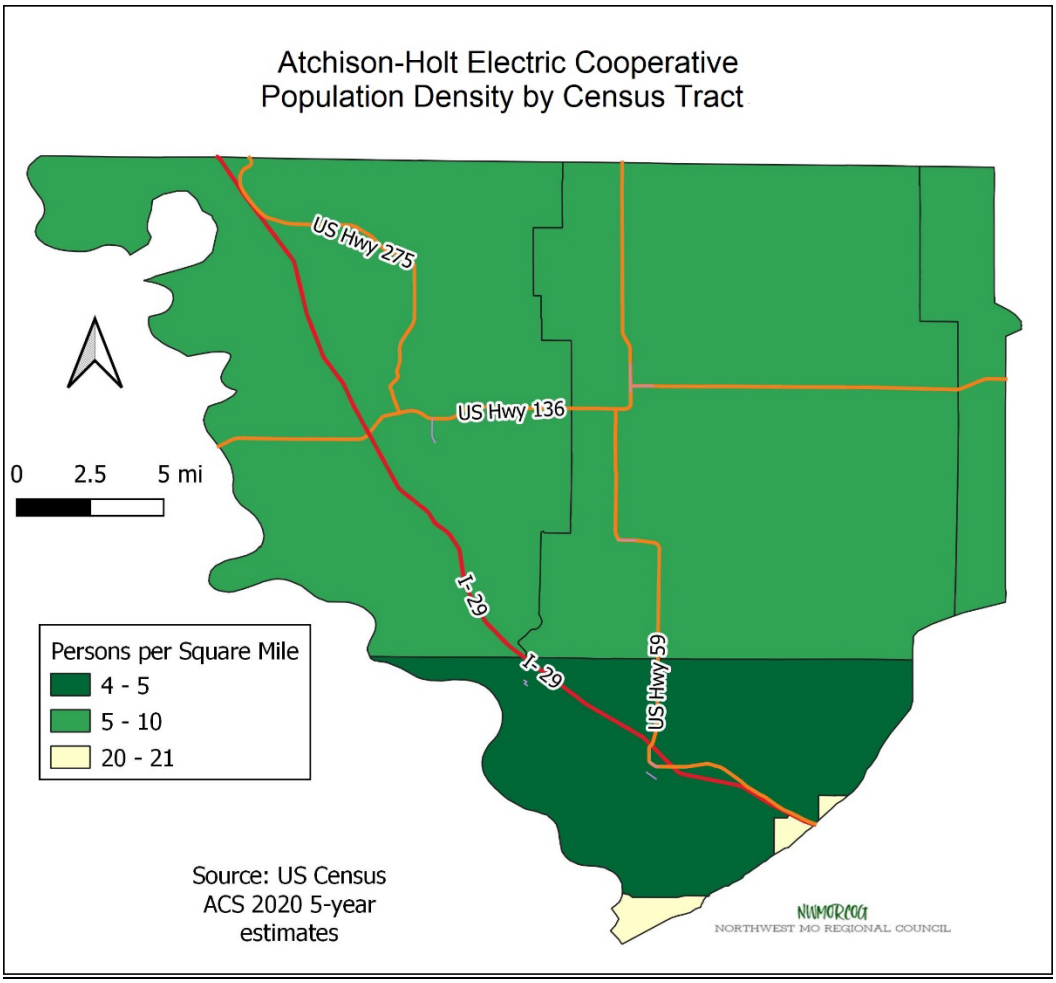
The customer base of AHEC currently exceeds 4,400 members in the three states of service. 2,610 of those members are located in the state of Missouri. Residential customers account for 85.9% of memberships (2,242 members), while non-residential customers make up the remaining 14.1% (368 members). Table 1 provides the summary of metered customers by Missouri County.

Table 1 *Meters by County*

County	Number of Meters
Atchison	1,304
Holt	1,179
Nodaway	127
Total	2,610

The average daily customer usage for AHEC is 71 kilowatt-hours (kWh). Annual total usage of AHEC customers in 2021 was 67,633,817 kWh of service. Population density for the cooperative service area is depicted in Figure 2 (*Map source: U.S. Census 2020*).

Figure 2 *Population Density Map*



Critical Facilities

It is important in mitigation planning for the Electric Cooperatives to identify the critical facilities in each area and to be able to prioritize reconnection and back-up power needs. AHEC provides service to Atchison County Wholesale Water Commission, which provides water for all of Atchison County.

Future Development

Atchison-Holt Electric provided no information about plans for future development in their service area. Table 2 below illustrates the population trend for the counties served by Atchison-Holt Electric.

Table 2 *County Population Trend, 1990-2030*

County	1990	2000	2010	2020	2030 Projected
Atchison	7,457	6,430	5,685	5,096	5,280
Holt	6,034	5,351	4,912	4,232	4,094
Nodaway	21,709	21,912	23,370	21,743	23,018
	Source: Missouri Census Data Center				

Planning Process

Since the planning process is the same for each of the electric cooperative plans, the details of the planning process are presented in the Statewide Summary section of the plan.

Appendices

Three appendices are included at the end of each plan:

Appendix A contains the Adoption Resolution; a document signed by the Cooperative's governing official showing that the Board of Directors has adopted the mitigation plan.

Appendix B contains the Documentation of Participation; copies of press releases, website postings and other public outreach that was made to request public comment.

Appendix C contains the Surveys; the Data Survey that is the source of data for the 2023 plan update; the Goals and Actions Survey is the updated review of the mitigation strategies.

Section 2: Asset Inventory

Atchison-Holt Electric Cooperative has a wide variety of assets by type. Real estate owned by the company includes office buildings, warehouses, garages, and other outbuildings throughout the service area. Twelve vehicles provide access to customers and infrastructure. AHEC does not own any electric generation or transmission infrastructure. 892 miles of distribution lines are owned and maintained by AHEC. Table 3 provides information concerning total asset valuation.

Table 3 *AHEC Asset Inventory Valuation Summary*

Asset	Total Replacement Cost	Cost Breakdown
Total AHEC Assets	$97,488,745	Buildings and vehicles - $5,000,000 Overhead assets - $78,411,410 Underground assets - $14,077,335
Distribution Lines	$57,912,428 OH $3,325,335 UG	OH Single-phase lines - $32,518,200 UG Single-phase lines – 1,626,135 OH Three-phase lines - $25,394,228 UG Three-phase lines - $1,699,200
Supporting Infrastructure	$20,498,982 OH $10,752,000 UG	Meters - $913,500 Poles - $8,610,750 OH Transformers - $5,863,200 UG Transformers - $10,752,000 Guys/Anchors - $1,203,619 Cross-arms - $1,223,689 Regulators - $944,803 SP Oil-Circuit Reclosures - $978,006 3phase Oil-Circuit Reclosures - $546,480 Capacitors - $214,935
Office Buildings	$2,000,000	
Warehouses	$1,000,000	
Vehicles	$2,000,000	
Source: Internal Atchison-Holt Accounting and Insurance records, 2021		

Ensuring quality distribution to its customers, Atchison-Holt maintains not only distribution lines, but also the supporting infrastructure as well. Table 4 includes a list of asset types, emergency replacement cost per unit or mile, the asset inventory by Service County, and total infrastructure numbers.

ATCHISON-HOLT ELECTRIC COOPERATIVE

Table 4 *AHEC Asset Inventory by Service County*

Asset	Emergency Replacement Cost per unit or mile	Number of units or miles: ATCHISON	Number of units or miles: HOLT	Number of units or miles: NODAWAY	Total number of units or miles:
Meters	$350/unit	1,304	1,179	127	2,610
Poles	$450/unit	11,461	6,908	764	19,135
SP*** Distribution Line	55,000/mile OH** ($10.52/foot OH) $76,560/mile UG*** ($14.50/foot UG)	399 OH 18 UG	239 OH 19UG	27 OH 5 UG	665 OH 42 UG
TP**** Distribution Line	$95,600/mile OH ($18.11/foot OH) $120,000/mile UG ($22.73/foot UG)	106 OH 3 UG	63 OH 3 UG	6 OH	179 OH 6 UG
Transformers	$2,100 OH $24,000 UG	1,354 OH 170 UG	1,079 OH 131 UG	129 OH 12 UG	2,792 OH 448 UG
Guys/Anchors	$125/unit	5,733	3,440	382	9,629
Cross-Arms	$184/unit	4,045	2,428	269	6,680
Regulators	$21,395/unit	26	17	1	44
Oil Circuit Reclosures	$3,800 SP $44,000 TP	112 SP 4 TP	93 SP 4 TP	12 SP 1 TP	258 SP 13 TP
Capacitors	$3,500/unit	18	35	9	62
Total Replacement Value By County		$68,359,801 OH $3,642,000 UG	$61,959,550 OH $3,243,000 UG	$9,739,974 OH $489,000 UG	$140,059,325 OH $7,374,000 UG

**OH = overhead ***UG = underground ***SP = Single phase ****TP – Three phase

Source: Internal Atchison-Holt Accounting and Maintenance records

Section 3: Risk Assessment

Risk Assessment Methodology

The risk assessment methodology used in the following section was utilized for both the statewide aggregation as well as for each individual cooperative chapter. Section 4 of the Statewide Summary details this methodology. Some variation in the availability of data exists between the electric cooperatives as each utilizes a different system of recording the impact of natural disasters. Any differentiation from the process below is explained in the individual cooperative's chapter as necessary.

For the purpose of the risk assessment, the identified hazards for the Atchison-Holt Electric Cooperative service area have been divided into two categories: **historical and non-historical hazards**. Based on the data collected for the update, the hazards have been reclassified to reflect the actual data available and those hazards with no data available have been reclassified as non-historical. This does not mean that a non-historical hazard will never cause damage; it just means there have been no impacts prior to this report. The potential still exists, but the probability of the occurrence is numerically near zero. For the analysis in this plan non-historical hazard probability is stated as less than one.

> **Historical Hazards** are those hazards with a measurable previous impact upon the service area. Damage costs per event and a chronology of occurrences are available. The associated vulnerability assessments utilize the number of years of data and cost of each event to establish an average annual cost per year. For AHEC, hazards with historical data include tornadoes, severe thunderstorms/high wind/hail, flood and levee failure, and severe winter weather.
>
> **Non-historical Hazards** are hazards with no previous record of impact upon the local service area. As such, the associated vulnerability assessments for each of these hazards will have an occurrence probability of less than 1% in any given year, but the extent of damage will vary considerably. For AHEC, hazards without historical data include earthquakes, dam failure and wildfire.

Each hazard has a unique impact upon the service area, requiring each hazard to utilize a different valuation amount depending upon the level of impact. Non-historical hazards assume damage to all general assets. For Historical Hazards, assets were divided into two groups based upon historical impact which were utilized in the hazard damage analysis:

- Overhead infrastructure assets and buildings
    - Used for:
        - Tornado damage assessments
            - Valued at $83,411,410
- Overhead infrastructure assets only
    - Used for:
        - Severe Thunderstorm / High Wind / Hail
        - Flood
        - Severe Winter Weather
            - Valued at $78,411,410

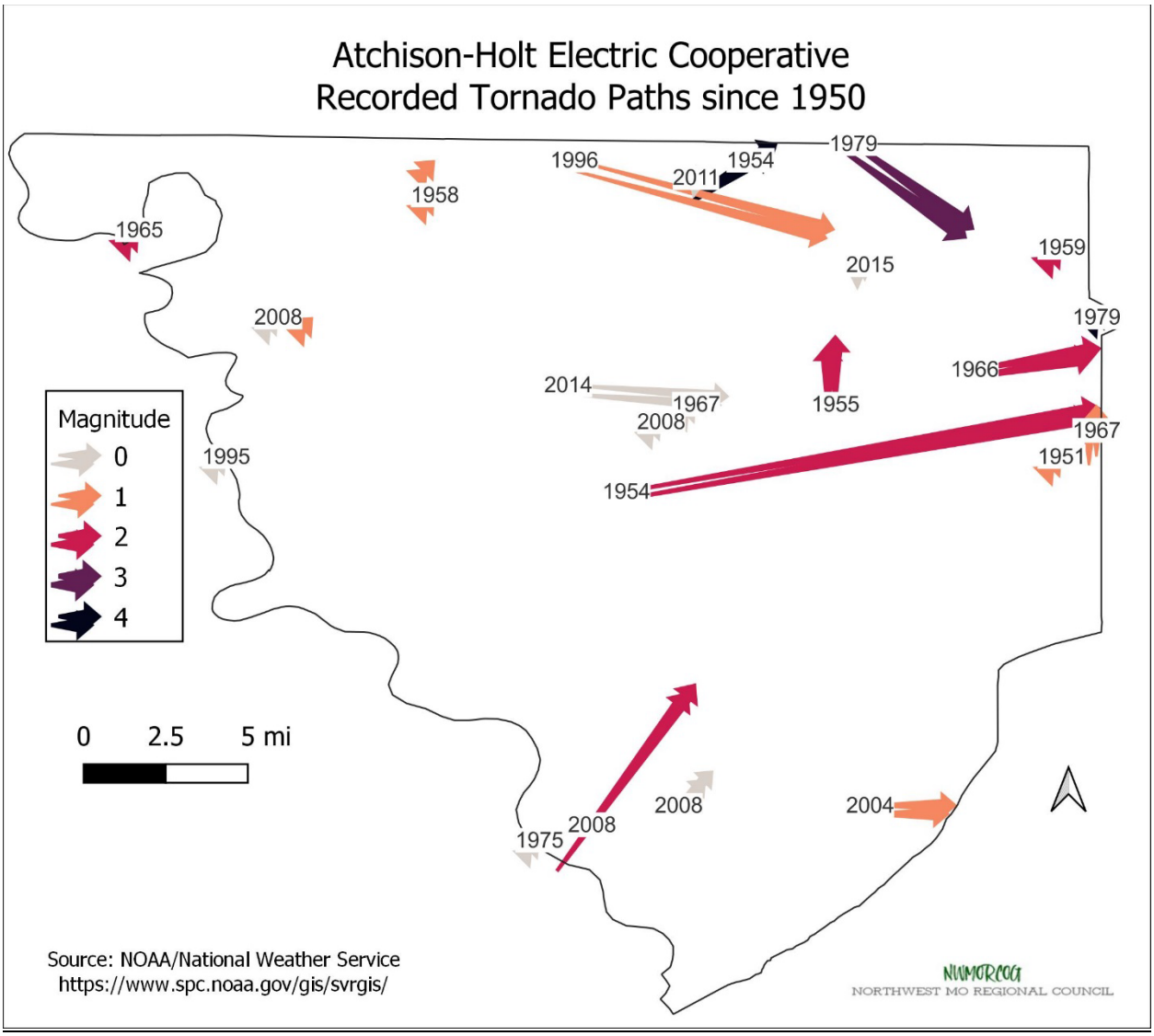
A. Historical Hazards

Tornadoes

Previous Occurrences

In the period 1950-2020, twenty-five (25) tornadoes have been reported within the Atchison-Holt cooperative boundaries. Figure 3 provides a pictorial representation of all recorded tornado touchdown sites and recorded path. (Data for map collected from NOAA.) F4 tornadoes did strike the area in 1954 and 1979 before data from the cooperative is available.

Figure 3 *Tornadoes in the AHEC Service Area, 1950-2020*



A data insufficiency exists, however, between 1968 and 1990 in cooperative records concerning damage estimates. For the purpose of this assessment, the years for which records exist for both data sets have

been used. From 1990-2016, Atchison-Holt's service area within the state of Missouri has experienced a total of 12 tornadic events.

Probability of Future Occurrence and Vulnerability

The probability of a tornadic event in the Atchison-Holt service area in any given year is 35% (25 events / 71 years). Estimated cooperative material damages associated with each of these events were compiled by AHEC staff. Five tornadoes caused damage to cooperative assets over the years existing in the cooperative records (1990-2020). The probability that Atchison-Holt will sustain damage from a tornado in any given year is 16.7%. Table 5 provides a summary of event dates, EF-scale ratings, damage cost estimates and outages reported.

Table 5 *AHEC Tornado Event Summary*

Date of Event	EF Scale Rating	Damage Estimates	Outages Reported
5/8/96	F1	$1,200	0
5/24/04	F1	$2,500	0
8/8/07	F0	$2,500	0
6/5/08	F0/F1	$2,500	0
9/9/14	EF0	$2,500	0
	Totals	$11,200	0
Data provided based on internal AHEC records which reflect cost from the referenced event year.			

Based upon the last 31 years of historical event records, the average tornado to affect the cooperative will include an EF0-EF1 rating, causing an average annual damage cost of $361 ($11,200 / 31 years). This averaged amount accounts for less than 1% of AHEC's total overhead assets and building valuation ($83,411,410).

None of AHEC's customers reported outages during recorded tornadoes since 1996. When compared with the total number of customers served by AHEC, it can be projected that less than 1% of all customers may report outages during any given tornadic event.

Problem Statement

Tornadoes are potentially such violent events that it is cost prohibitive to build an infrastructure that can withstand such powerful winds. Strategies could be developed or improved, if already in place, to ensure that employees are warned of approaching storms when in the field. Procedures to restore power after outages should be reviewed regularly to ensure that power is restored to critical facilities as quickly as possible.

Severe Thunderstorms, High Wind, and Hail

Previous Occurrences

From 1955-2020, Atchison-Holt's service area within the state of Missouri has experienced a total 193 hail events and 139 thunderstorm/high wind events. Table 6 provides a summary of those hail events

which caused damage to cooperative infrastructure by date, cost estimate of damage, and reported outages.

For this update, it was possible to look at the bounds of the Atchison-Holt Electric Cooperative using GPS, finding 193 hail events and 139 high wind/thunderstorm events from 1955-2020

Table 6 *AHEC Hail Event Damage Summary*

Event Date	Damage Estimates	Outages Reported
5/14/96	$500	0
5/20/96	$1,000	0
8/19/96	$500	0
7/23/97	$2,000	0
5/19/98	$300	0
6/13/98	$800	0
5/26/00	$100	0
6/13/00	$800	0
6/23/00	$200	0
7/26/00	$1,000	0
4/5/01	$50	0
5/10/01	$300	0
7/3/01	$100	0
9/7/01	$800	0
4/18/02	$800	0
4/24/02	$1,000	0
5/6/02	$900	0
7/26/02	$250	0
4/15/03	$50	0
5/24/04	$2,500	0
6/12/04	$500	0
8/25/04	$3,000	0
8/26/04	$1,000	0
6/4/05	$200	0
3/21/07	$50	0
5/6/07	$500	0
8/8/07	$2,500	0
4/25/08	$500	0
5/24/08	$1,500	0
6/4/08	$50	0
6/5/08	$2,000	0
3/23/09	$180	0
6/1/09	$50	0
6/7/09	$50	0
8/19/09	$1,000	0

Event Date	Damage Estimates	Outages Reported
4/3/11	$200	6
6/27/11	$250	54
3/29/12	$2,700	16
4/17/13	$1,750	301
5/19/13	$6,000	167
5/28/13	$10,200	439
7/7/14	$250	26
5/25/15	$450	65
5/26/16	$500	4
Totals	$49,330	1,078
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

Table 7 provides the same information for thunderstorm/high wind events

Table 7 *AHEC Thunderstorm / High Wind Event Summary*

Event Date	Damage Estimates	Outages Reported
7/19/96	$1,000	0
6/21/97	$1,500	0
7/23/97	$2,000	0
4/14/98	$1,000	60
5/15/98	$400	495
5/20/98	$1,500	5
4/5/99	$1,200	237
4/8/99	$2,000	1,810
6/27/99	$1,000	37
7/30/99	$2,500	338
6/13/00	$800	289
6/23/00	$200	46
8/19/00	$700	12
4/7/01	$0	312
4/11/01	$1,500	96
5/10/01	$300	1
7/18/01	$300	386
8/17/02	$500	117
4/15/03	$50	0
8/19/03	$50	72
5/22/04	$300	116
6/12/04	$500	43
8/25/04	$1,500	10
8/26/04	$1,000	121

Event Date	Damage Estimates	Outages Reported
6/28/05	$50	31
3/30/06	$1,200	467
8/8/07	$500	840
4/25/08	$500	48
6/5/08	$2,000	2,369
6/1/09	$50	4
8/4/09	$500	515
8/9/09	$50	174
7/18/10	$500	81
8/31/10	$1,200	71
5/11/11	$700	7
6/26/11	$7,500	434
8/6/11	$400	211
8/18/11	$700	68
5/18/13	$500	68
5/27/13	$8,700	138
9/19/13	$7,200	67
6/3/14	$2,100	75
9/9/14	$2,300	333
11/11/15	$200	132
7/7/16	$75,500	844
Totals	$134,150	11,580
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

Probability of Future Occurrence and Vulnerability

The probability of a hail event in the Atchison-Holt service area in any given year is 100% with an average annual number of 2.9 hailstorms (193/ 66 years). Estimated material damages associated with each of these events were compiled by AHEC staff. Forty-four of the hail occurrences caused damage to cooperative assets.

Based upon historical records, the average hail event to affect the cooperative will cause an average damage cost of $1,897 ($49,330 / 26 years of records). This averaged amount accounts for less than 1% of AHEC's total overhead asset valuation. The total number of members without service due to a hail event was 1,078. An average of 24.5 customers reported outages during recorded thunderstorm hail events when an event occurred. This would be less than 1% of the members reporting outages during an event.

The probability of a thunderstorm/high wind event in any given year is 100% with an average number of 2.1 windstorms per year (139 events / 66 years). Forty-five of the thunderstorm/high wind occurrences caused damage to cooperative assets.

Based upon historical records, the average thunderstorm/high wind event to affect the cooperative will cause an annual average damage cost of $5,160 ($134,150 / 26 years of records). This averaged amount accounts for less than 1% of AHEC's overhead asset valuation. An annual average of about 463 members reported outages during recorded thunderstorm and high wind events since 1996. When compared with the total number of customers served by AHEC, it can be projected that 17.7% of all customers may report outages in during any given year due to a thunderstorm/high wind event.

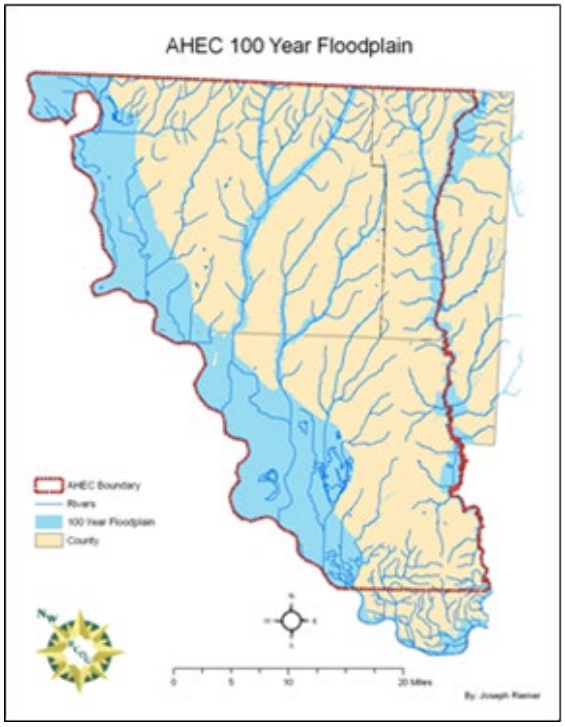
Problem Statement

Looking at the data, a trend towards more damages and more outages is evident over the last ten years. With the intensity of thunderstorm events increasing during recent years, an analysis of which assets are damaged in these events and an implementation of steps to minimize the damage to the infrastructure and outages to members should be initiated.

Flood and Levee Failure

Flood and levee failure carry, perhaps, the greatest ongoing potential threat to the existing infrastructure of the Atchison-Holt Electric Cooperative. In Atchison County, approximately 15% of the cooperative service area in is located directly within the 100 year floodplain. 40% of the Holt County service area and 10% of the Nodaway county service area also lie in the floodplain. Figure 4 below depicts the 100 year floodplain in relation to the cooperative's boundaries. *(Map sources: FEMA HAZUS-MH; DFIRMS; Missouri Office of Administration, and Association of Missouri Electric Cooperatives.)*

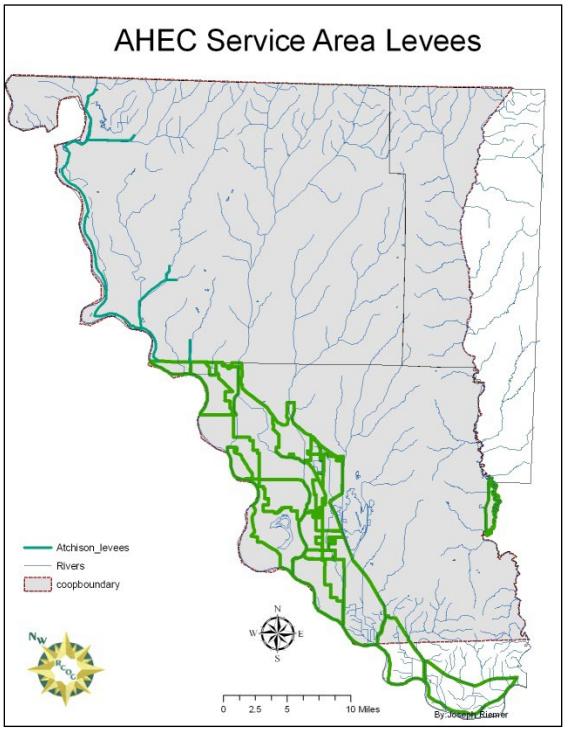
Figure 4 *Floodplain Map*



Currently, inundation data for levee failure is lacking due to issues surrounding mapping, appropriate models, and its close association with flooding events. Figure 5 below provides the location of known

state and federal levees within the cooperative's boundaries. *(Map sources: Atchison County Emergency Management Agency, Holt County Commission, USDA.)*

Figure 5 *Levee Map*



Previous Occurrences

From 1993-2021, Atchison-Holt's service area has experienced 71 flooding events. Currently, no data concerning levee failure damage can be separated from flood damage data. Table 8 summarizes flood event dates by month, damage cost estimates, and reported outages.

Table 8 *AHEC Flood / Levee Failure Event Summary (1993-2021)*

Event Date	Damage Estimates	Outages Reported
1993	$94,900	0
May 2007	$102,050	0
June 2010	$137,500	0
June 2011	$316,320	0
July 2016	$500	52
March 2019	$954,502	0
Totals	$1,605,772	52
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

Probability of Future Occurrence and Vulnerability

The probability of a flood/levee failure event affecting the cooperative assets in any given year is 100% with an average of 1 flooding events each year. Estimated material damages associated with each of these events were compiled by AHEC staff. Six of the occurrences caused damage to cooperative assets. There is a 21% chance of a damaging flood in any given year (6 / 29).

Flood and levee failure events vary widely based upon numerous factors including, but not limited to, annual precipitation and extent of levee damage. Not all events, however, are extensive as evidenced in Table 8. Based upon historical records, the average flood/levee failure event to affect the cooperative will cause an annual average damage cost of $55,371 ($1,605,772 /29 years). This averaged amount accounts for about 2% of AHEC's overhead asset valuation ($1,605,772/ $78,411,410).

Only 52 AHEC customers reported outages during recorded flooding events since 1993, which results in an average of one outage per event or about 2 per year. When compared with the total number of customers served by AHEC, it can be projected that less than 1% of all customers may report outages during any given flooding event or levee failure in any given year.

Problem Statement

The occurrence of flooding events is often a result with the heavy rains from thunderstorm events. Coordination of mitigation strategies with local officials could result in mutually beneficial results for all parties.

Severe Winter Weather

Previous Occurrences

From 1997-2016, Atchison-Holt's service area has experienced a total of 32 severe-winter weather events, including significant snowfall and ice storms. On February 1, 2015, the continuation of a storm brought up to eight inches of snow across the AHEC service area. The most severe ice storm in recent history was in December of 2017. A slow moving storm system brought a long duration of freezing rain to the region resulting in ice accumulations of up to an inch. Numerous tree branches and power lines were downed with many people having to spend several nights in shelters. To update this data, NCEI reported 6 winter weather events occurring during the past five years in the area. AHEC did not report any additional damages or outages since the last update.

Probability of Future Occurrence and Vulnerability

The probability of a severe winter weather event in the Atchison-Holt service area in any given year is 100% (6 events / 5 years) with an annual average of 1.2 events. Estimated material damages associated with each of these events were compiled by AHEC staff, but damage estimates are available from 2001-2021 only. During the time period from 2001-2016 there were 28 NOAA reported severe winter weather occurrences in the three-county area. Fifteen occurrences caused damage to cooperative assets, resulting in a 75% probability that a severe winter weather occurrence will produce damage in any given year (15 / 20 years) .

Table 9 provides a summary of event dates, types, associated damage estimates, and reported outages.

Table 9 *AHEC Severe Winter Weather Event Summary*

Event Date	Event Type	Damage Estimates	Outages Reported
2/9/01	Snow	$13,490	2,203
3/15/01	Snow	$1,200	395
1/3/05	Winter storm	$100	133
2/12/07	Snow	$1,500	0
12/1/07	Ice storm	$300	0
12/10/07	Ice storm	$335,695	1,500
11/16/09	Snow	$0	1,094
1/16/10	Winter storm	$2,500	237
2/1/11	Winter Storm	$300	25
11/9/11	Winter Weather	$1,650	271
12/20/12	Blizzard	$650	79
1/29/13	Winter Weather	$250	3
2/21/13	Winter Storm	$250	43
12/21/13	Heavy Snow	$400	2
2/1/15	Heavy Snow	$2,000	125
	Totals	$360,285	6,110
Data provided based on internal AHEC records which reflect cost from the referenced event year.			

Based upon these historical records, the average severe winter weather event to affect the cooperative will cause an average annual damage cost of $14,411 ($360,285 / 25 years). This averaged amount accounts for less than 1% of AHEC's total overhead asset valuation ($14,411 / $30,245,705).

An average of 244 outages was recorded during severe winter weather events since January, 2001. When compared with the total number of customers served by AHEC, it can be projected that 9.3% of all customers may report outages during any given severe winter weather event or about 11 outages on average each year.

Problem Statement

Although economically difficult to accomplish, the placement of transmission lines underground provides safety from ice storms and high wind events.

B. Non-historical Hazards

Wildfire

Previous Occurrences

The incidence of wildfire in the AHEC service area presents a unique risk assessment. Wildfire events have occurred in each of the three counties. According to the Missouri Department of Conservation, Atchison, Holt, and Nodaway counties have experienced 824 wildfires between 2004 and 2016. Table 10 summarizes the incidences of wildfire within the three counties. When looking at the data from Nodaway County, it is important to remember that AHEC has only 5% of its meters and 7% of its overhead assets located in this county.

Table 10 *Wildfire Summary by County*

County	# of Wildfires, 2004-2016	Average Annual # of Wildfires	Acres Burned	Average Annual Acres Burned
Atchison	208	16	1808	139
Holt	137	10.54	829	64
Nodaway	479	36.85	6,963	536
Totals	824	63.38	9,600	739
Source: Missouri State Hazard Mitigation Plan, 2018				

Probability of Future Occurrence and Vulnerability

The probability of a wildfire event in the Atchison-Holt service area in any given year is 100% with an annual average of 63 wildfires. Over half of those reported wildfires occurred in Nodaway County. Like earthquakes and dam failure, wildfires have had no measurable impact upon the AHEC service area assets. However, for the purposes of this assessment, wildfire and its associated impacts cannot be eliminated from the realm of possibility.

The potential extent of damage caused by wildfire is difficult to determine. Cooperative assets are located throughout the service area rather than being located at a single central site. With an average annual of 726 acres burned in the service area, it is unlikely that infrastructure damage would exceed 1% based upon asset location and unlikeliness of an uncontrollable wildfire. No customers have reported outages during recorded wildfires between 2004 and 2016. When compared with the total number of customers served by AHEC, it can be projected that less than 1% of all customers may report outages during any given wildfire event.

Problem Statement

Further study will be required to create a model for damage assessments related to wildfire.

Earthquakes

Previous Occurrences

The closest source of earthquake risk in northwest Missouri is the Nemaha Fault, which runs roughly from Oklahoma City, Oklahoma north to Lincoln, Nebraska. In 1993, the Nemaha fault produced a discernable earthquake that was felt in the region, rating a 2.9 on the Richter Scale of Earthquake Intensity. Additional quakes took place February 11, 1995 (3.1 magnitude); July 16, 2004 (3.5 magnitude); March 23, 2003 (3.1 magnitude) and December 17, 2009 (3.6 magnitude). More recently a 4.8 magnitude event centered near Wichita, Kansas shook the AHEC service area on November 12, 2014. On September 3, 2016, a 5.6 magnitude earthquake was felt throughout the region. Although a relatively quiet fault system, the Nemaha fault has the potential to produce a damaging earthquake, profoundly impacting the Atchison-Holt Electric Cooperative.

The region is also subject to effects of the New Madrid Fault located in extreme southeast Missouri, which has, according to many experts, the potential to produce the largest earthquakes in North America. Undoubtedly, this fault has the potential to affect the AHEC service area in its entirety. In addition, there have been several small, virtually undetectable earth movements in the region in recent history, which may or may not be attributed to the aforementioned fault lines or other, very small faults located nearby.

While the Nemaha fault is geographically closer and geologically active, C.E.R.I. records demonstrate the limited impact of said earthquakes, with no quakes to date exceeding a 5.6 magnitude. Its cascading effects have been largely restricted to more localized regions, but even then the damage caused has been minimal. By contrast, the New Madrid fault has the potential to cause damage throughout the state of Missouri, including the AHEC service area.

Probability of Future Occurrence and Vulnerability

Scientists from the U.S. Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis have estimated the probability of a magnitude 6.0 or greater earthquake from the New Madrid Fault is 25-40 percent through the year 2053.

The projected earthquake intensity ratings for the cooperative region changes based upon the Modified Mercalli Scale. Given a New Madrid earthquake with a 6.7 magnitude, the region would experience Level V intensity characteristics. In the event of an earthquake with a 7.6 magnitude, the region would experiences Level VI intensity characteristic while an earthquake with an 8.6 magnitude would most likely cause Level VII intensity characteristics.

In the event of an earthquake with a 7.6 magnitude, the AHEC service area would most likely experience minor building damage as well as damage to the electrical distribution system based upon the damages associated with Level VI impacts. This damage, however, would most likely be relatively minimal and localized when compared with the southeast corner of the state based upon the Intensity Scale. Distribution lines overhead and underground could become disconnected or severed, and transformers could be damaged, though the possibility is much more limited than in eastern Missouri. Though the probability of occurrence is very small, the potential extent of damage could significantly impact both the cooperative and its customers. Based upon information from CERI, FEMA, and SEMA and using the

standardized scale for Missouri REC's, it may be estimated that up to 10%, or 269 customers, could report outages related to an earthquake event of 7.6 magnitude.

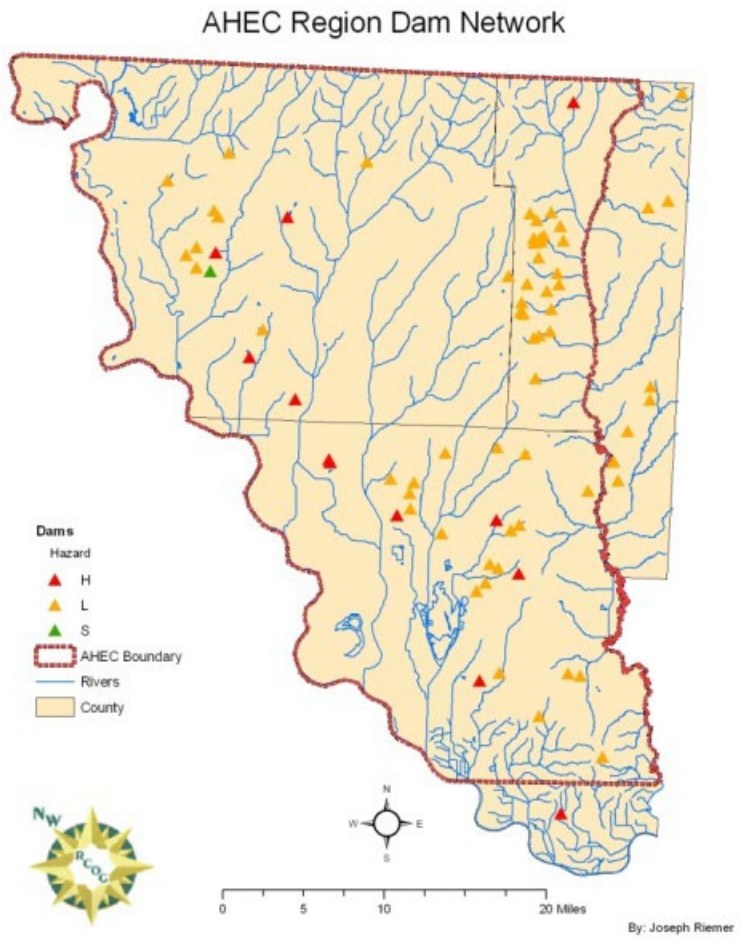
Problem Statement

AHEC should strive to meet seismic design standards for electrical substation equipment and other overhead assets susceptible to damage from earthquake events.

Dam Failure

Like earthquakes, dam failures have had no measurable impact upon the AHEC service area to date. According to the National Inventory of Dams, 64 dams currently exist within the cooperative boundaries: 15 in Atchison County, 27 in Holt County, and 22 in Nodaway County. Of these dams, five in Atchison County and six in Nodaway County are regulated by the state due to the fact that they are non-agricultural, non-federal dams which exceed 35 feet in height. Figure 6 shows the locations of all known dams located within Atchison-Holt's service area. *(Map sources: www.msdis.missouri.edu; www.dnr.mo.gov/env/wrc*.

Figure 6 *AHEC Region Dam Network*



Previous Occurrences

The 2018 Missouri State Hazard Mitigation plan states “For the 42-year period from 1975 to 2016 for which dam failure statistics are available, 19 dam failures and 68 incidents are recorded. According to this data, annual probability calculates to a 45 percent annual probability of a dam failure somewhere in the state and a 100 percent annual probability of dam incidents. In should be noted that historical dam failures and incidents include events from all hazard classes and all dams (whether regulated or un-regulated). Failures and incidents for regulated dams that have higher inspection frequencies should be less probable. The probability of future events is 45%."

Probability of Future Occurrence and Vulnerability

For the purposes of this assessment, dam failure and its associated impacts cannot be eliminated from the realm of possibility. In order to allow for a risk assessment, the probability of this event has been included as less than 1%. This assessment assumes an impact only upon downstream electric distribution infrastructure in the path of the inundation for both infrastructure damage and service interruption. Determining the potential extent of dam failure is currently impossible due to a lack of data concerning inundation zones.

Problem Statement

Further study concerning existing dams and the impact of their failure is required to make a more comprehensive assessment of potential damages and mitigation strategies to address this potential damage. Since AHEC has assets along the Missouri River, the presence of numerous upriver dams with millions of acre-feet of storage, should be considered when developing mitigation strategies.

C. Risk Assessment Summary

Most of the historical hazards have had an impact on the electric cooperatives. Table 11 below shows the annual damages associated with each hazard for AHEC. The table is ranked by the highest Average Annual Damages which is an indication of the vulnerability to each hazard.

Table 11 *AHEC Hazard Risk Summary*

Hazard	Average Annual Damages
Flood and Levee Failure	$55,371
Severe Winter Weather	$14,411
Severe Thunderstorms, and High Winds	$5,160
Tornadoes	$361
Hail	$1,897
Earthquakes	$0
Dam Failure	$0
Wildfire	$0

Each of the non-historical hazards Wildfire, Earthquakes and Dam Failure has the potential for causing catastrophic damages in any given year. To date there have been zero damages to the assets of the Atchison-Holt Electric Cooperative from the non-historical events. Nonetheless, this set of hazards should be considered in mitigation strategies because of the damage potential.

Section 4: Mitigation Strategies

Previous Mitigation Efforts

For organizations like AHEC, mitigation is part of prudent business operations. To ensure the delivery of a quality product and minimize service interruptions, a number of mitigation strategies are continually utilized. Routine maintenance and upgrades to existing equipment are completed as part of daily tasks. Vegetation management is utilized to limit the cascading effects of natural hazards. Safety and reporting information are disseminated to the public through various types of media. Mutual aid agreements and partnerships create relationships which provide for future support in the event of a natural disaster.

Additionally, mitigation is considered prior to any expansion of service into special hazard areas. Before any service is built, it is first "staked out" in coordination with local builders and property owners. This process, completed by the Line Superintendent and contracted engineers, identifies, and addresses foreseeable hazards and safety issues before any new service lines area constructed. USDA-RUS specifications regarding operation and safety are utilized in every step of the process. Steps are taken to practically minimize the exposure of equipment to loss due to foreseeable hazards, particularly flooding. Customers who reside in the floodplain are not charged for repairs or losses associated with flooding unless they purposefully destroy or restrict the cooperative from protecting their distribution system assets.

Existing and Potential Resources

As stated above, mitigation is a key component of good business practices. Atchison-Holt Electric Cooperative includes mitigation strategies as part of regular work activities to ensure service with minimal interruptions. Funding for these activities is provided through the cooperative's normal budgetary process for maintenance.

In order to expand mitigation efforts beyond normal maintenance, it is likely that AHEC will need to seek outside funding sources. These may include private, state, or federal programs which provide grant and loan funding. Upon passage of this plan, AHEC will be eligible for funding through FEMA in the following categories:

- Hazard Mitigation Grant Program
- Flood Mitigation Assistance Program
- Pre-Disaster Mitigation Program
- 406 Stafford Act
- USDA Economic Development grants

Review of Goals and Actions

To focus on the mitigation actions for the 2023 update to this plan, it was decided to reach consensus on four goals that would address the needs of every cooperative member of AMEC and eliminate the objectives from previous updates. The AHEC mitigation staff reviewed these goals and the actions from the previous update which addressed hazard mitigation issues. They evaluated each action to decide if it was completed, will be continued, or should be deleted. There also was the opportunity to add new actions.

The staff considered which type of actions will maximize benefits and minimizes costs, how mitigation strategies will be implemented, and how the plan will be maintained and updated. Table 12 lists the goals as reviewed in the 2023 plan update.

Table 12 *AHEC Goals*

Identified Goals	Reassessment of the Goal- 2023
Goal 1: Protect the health and safety of the community.	Accept, as is
Goal 2: Reduce future losses due to natural hazard events.	Accept, as is
Goal 3: Improve emergency management capabilities and enhance local partnerships.	Accept, as is
Goal 4: Continue to promote public awareness and education.	Accept, as is

Traditionally, the STAPLEE (Social, Technical, Administrative, Political, Legal, Environmental, and Economic) method is used to prioritize mitigation actions. These categories, however, do not necessarily align with the private sector in the same way they are applicable to governmental agencies. Several action items could be included with multiple goals, for example. As a result, the cooperatives chose to use a different method to prioritize their mitigation strategy.

The chosen method of reviewing the proposed and existing mitigation strategies was to perform a cost-benefit analysis of all mitigation actions. The analysis was based on past experiences of performing certain actions and the potential number of beneficiaries. The following matrix, Table 13, was used to rate each mitigation action. Cooperative staff was asked in the Goals and Actions Survey to review the cost-benefit rating and change if necessary.

Table 13 *Cost Benefit Matrix*

COST	BENEFIT		
	High	Medium	Low
High	7	4	1
Medium	8	5	2
Low	9	6	3

The following tables represent the completed review of current and potential mitigation strategies. Each strategy has assigned a cost benefit score assigned by the cooperative staff based on prior experience and professional opinions. Table 14 shows review the actions and the results of the cost-benefit analysis. The table has been updated through the Goals and Actions Survey that was sent to facilitate the staff update review. The Survey can be found in Appendix C. Staff members reviewed each item on the original tables and determined the status of the item.

Table 14 *Prioritized Mitigation Actions for Atchison-Holt Electric Cooperative*

Goal-Action#	Action Item	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
1-1	Use vegetation management to prevent the public danger of downed lines	Continue (In-progress)	We continue to conduct annual vegetation management including but not limited to spraying, cutting and treating areas which may become impediments to the delivery of energy.	Thunderstorms Wildfire Winter Weather	annually	8
1-2	Increase number of generators owned for use in critical asset outages.	Continue (Not started)	We do conduct periodic interviews with critical asset members to discuss options due to extended interruption of service.	All hazards	2024	6
1-3	Partner with county emergency management to ensure power for local shelters, fuel stations, and public safety.	Continue (In-progress)	We do solicit various local organization to offer assistance with power for critical infrastructure in addition to severe weather events.	All hazards	annually	6
2-1	Raising transformers with pad mounts in flood prone areas.	Continue (In-progress)	We continue to invest in our physical plant annually to ensure the integrity of our system. We continue to do annual line inspection, pole inspection and infra-red inspection to identify and repair any issues in a timely manner. We also prioritize each item and track each job to completion.	Dam Failure Flooding Levee failure	2027 or later	7
2-2	Upgrade to concrete or steel poles where possible.	Continue (Not started)	We are still assessing where this action would be prudent and reasonable. To date we have not implemented any of these actions, but are continuing to consider adding this to our construction work plans.	All hazards	2027 or later	4
2-3	Add alternate source wiring to eliminate or reduce time of outages.	Continue (In-progress)		All hazards	2027 or later	6
2-4	Convert overhead lines to underground lines or vice versa in troubled areas based on vulnerability.	Continue (Not started)	Due to the high cost and relative few places where this would be effective, we have not conducted any of these activities, but continue to research areas where it may be feasible to do so.	Flooding Wildfire Winter Weather	2027 or later	1

Goal-Action#	Action Item	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
2-5	Research methods for waterproofing meters in flood-prone areas.	Continue (Not started)	At present we are unaware that such technology exists to fully waterproof a meter enclosure.	Dam Failure Flooding Levee failure Thunderstorms	2027 or later	4
2-7	Utilize GIS technology to improve site identification and response time.	Continue (In-progress)	We have not used this technology to integrate with dispatching and fault location, but are researching opportunities.	All hazards	2023	2
2-8	Monitor developments in data availability concerning the impact of dam failure and wildfire upon the service area through local, state, and federal agencies.	Continue (In-progress)	We do monitor websites that offer flood level prediction as to better understand the impacts of such weather events.	Dam Failure Flooding Levee failure Thunderstorms	annually	6
3-1	Maintain mutual aid agreements with other rural electric cooperatives.	Continue (In-progress)	We continue to work with our statewide agency to ensure we have the ability to receive and offer assistance to other cooperatives when necessary.	All hazards	annually	9
3-2	Cooperate with local law enforcement and government officials to reduce the impact of power outages.	Continue (In-progress)	We have interaction with various local officials to discuss the impact of loss of power to critical infrastructure.	All hazards	annually	6
3-3	Consider implementation of automated voice response systems to improve outage reporting.	Continue (In-progress)	We continually search for methods which would improve our after hours outage reporting.	All hazards	2023	6
4-1	Provide safety and reporting information to the general public: using local newspapers, through presentations and publications, through the company's website and/or social media sites.	Continue (In-progress)	During any severe outage event or any planned service interruption we notify our members with timely reporting with all media outlets at our disposal.	All hazards	annually	6

After review, there were one Action completed and removed from the Action Items list for the 2023 plan update. There was one Action deleted. These Actions are shown in the following table. There are no additional actions added to the 2023 plan.

Table 15 *Completed/Deleted Mitigation Actions for Atchison-Holt Electric Cooperative*

Actions Item	Status Update	Explanation for Deleted Action
Complete annual inspections of lines and poles.	Delete this action	Annual routine procedures do not need inclusion in this plan
Collect GPS data for all existing infrastructure.	Action Completed	We have just recently completed the work of collecting all gps coordinates for the majority of our distribution assets.

Section 5: Plan Implementation and Maintenance

Plan Incorporation

The goals and actions of the previous section identify both ongoing efforts at mitigation and potential methods for expanding efforts. The updated plan has been reviewed and adopted by the Board of Directors as part of the company's operations policy. This mitigation plan necessitates involvement from every AHEC employment level as the organization strives to ensure quality service to their customers.

Local Planning Capabilities

Some internal planning capabilities do exist at AHEC. The Hazard Mitigation Plan can be considered and/or incorporated into regular budgetary planning and the four-year work plan. Planning capabilities per se for the electric cooperatives are limited. What is important is that the Action Items developed through the mitigation planning process are incorporated into the daily activities of the cooperative.

The four-year work plans embrace the mitigation efforts that are in the mitigation plan. The electric cooperatives across Missouri are always working to strengthen their systems. This would include installing stronger/larger poles when smaller ones need to be changed out, installing stronger/larger conductors that can carry more weight and decreasing span lengths between poles, installing larger anchors, relocating structures out of flood plains, and installing structures to stop cascading during ice storms.

Other capabilities are unique to the electric cooperative's business of providing reliable electricity to their members. Many of the Action Items listed in the plan include tree trimming plans, use of GPS to locate outages, service upgrades to lines and poles, warning systems and use of weather radios, collection of GIS data and utility specific software for locating and rerouting outages to restore power, all contribute to local capabilities. Integration of Atchison-Holt's planning with local law enforcement, mutual aid agreements, and partnerships with local emergency management resources ensures power to critical facilities during a hazard event. This coordination and cooperation broaden the capabilities of the local cooperative.

Beyond the AHEC Hazard Mitigation Plan, regional planning capabilities exist at the local level. The Missouri counties of Atchison, Holt, and Nodaway each have a FEMA-approved Natural Hazard Mitigation Plan in place. County emergency management directors have Local Emergency Operations Plans which seek to mitigate the same hazards for residents. These same counties are also included in the Regional Transportation Plan (RTP) as well as a Comprehensive Economic Development Strategy (CEDS). AHEC's plan can be easily incorporated into these local plans and allow for coordination across agencies in the event of an emergency.

AHEC is located within the rural portions of third-class counties which are prohibited from enforcing building codes and zoning by the state of Missouri. They do not provide service to any municipality within these counties. Comprehensive plans and Capital Improvement plans do not exist inside of the AHEC service areas.

Plan Maintenance

Atchison-Holt will follow the requirements coordinated by the Association of Missouri Electric Cooperatives (AMEC) for monitoring, evaluating, and updating the plan.

Continued Public Involvement Opportunities

Public notice was given in the form a notice in the *Rural Missouri*, a publication of the Association of Missouri Electric Cooperatives, distributed to all cooperative members. The updated plans were provided to each individual cooperative for public review and comment. Comments were considered and addressed. Once all co-op plans were completed, they were assembled into one plan and submitted to the State Emergency Management Agency and the Federal Emergency Management Agency for review and approval. The documentation for public involvement and comments can be found in Appendix B of each cooperative's section of the plan.

Atchison-Holt will follow to the requirements coordinated by the Association of Missouri Electric Cooperatives (AMEC) for continued public involvement. Opportunities for public comment will continue to be offered through various media outlets and the physical office of AHEC.

Appendix: A - Adoption Resolutions

ATCHISON-HOLT ELECTRIC COOPERATIVE

A copy of the signed adoption resolution will go on this page

Appendix: B - Documentation of Participation

ATCHISON-HOLT ELECTRIC COOPERATIVE

This ad was published in the *Rural Missouri,* a monthly publication of the Missouri Association of Missouri Electric Cooperatives, giving public notice to all subscribing members of AMEC.

An updated copy of the Rural Missoui Ad will go here

Appendix: C - Surveys

ATCHISON-HOLT REC SURVEYS

Data Survey

The following is the returned survey from AHEC which was used by NWMORCOG staff to update the Plan:

Please correct/update the following information from the previous plan.

Atchison-Holt Electric Cooperative (AHEC) was established in 1938 to provide electric service to the rural areas of northwest Missouri. A Touchstone Energy Cooperative, AHEC is headquartered in Rock Port, Missouri, and provides service to customers in Atchison, Holt, and Nodaway counties in Missouri as well as three counties in Iowa and Nebraska. The cooperative is run by a board of nine directors which approve the company's mission and internally developed business policy:

"Atchison-Holt Electric Cooperative is dedicated to providing our members with a reliable, competitively-priced, high quality supply of electric energy, while adhering to cooperative principles and striving to improve the quality of life for all members through a highly trained, efficient staff."

AHEC's service boundaries within the state of Missouri include Atchison and Holt counties in their entirety as well as the western portion of Nodaway County. The cooperative owns 892 miles of service line within these counties. Figure ? depicts the geographic boundaries of the cooperative in relation to USGS local quadrangles within the state of Missouri. *(Map sources: www.usgs.gov, Association of Missouri Electric Cooperatives, Atchison-Holt Electric Cooperative.)* *Service Area Map* if needed, please replace or attach a different map if available or provide info of changes so a new map can be constructed

AHEC Cooperative Boundaries

ATCHISON-HOLT REC SURVEYS

The customer base of AHEC currently exceeds 4,400 members in the three states of service. 2,610 of those members are located in the state of Missouri. Residential customers account for 85.9% of memberships (2,242 members), while non-residential customers make up the remaining 14.1% (368 members). Table ? provides the summary of metered customers by Missouri County.

Meters by County

County	Number of Meters
Atchison	1,304
Holt	1,179
Nodaway	127
Total	2,610

The average daily customer usage for AHEC is 71 kilowatt-hours (kWh). Annual total usage of AHEC customers in 2021 was 67,633,817 kWh of service

Population Density Map will be updated by staff at NWMORCOG

Critical Facilities It is important in mitigation planning for the Electric Cooperatives to identify the critical facilities in each area and to be able to prioritize reconnection and back-up power needs. AHEC provides service to Atchison County Wholesale Water Commission, which provides water for all of Atchison County

Future Development The info wanted here is if any of your members you serve have future development plans that would potentially affect your operation.

The FEMA reviewers that approved the previous update suggested including current operating budget information, any capital improvements, or strategic initiatives in this update. Please add or attach if possible.

Asset Inventory Please update the figures below to the most current information.

Atchison-Holt Electric Cooperative has a wide variety of assets by type. Real estate owned by the company includes office buildings, warehouses, garages, and other outbuildings throughout the service area. Twelve vehicles provide access to customers and infrastructure. AHEC does not own any electric generation or transmission infrastructure. 892 miles of distribution lines are owned and maintained by AHEC. Table ? provides information concerning total asset valuation.

ATCHISON-HOLT REC SURVEYS

AHEC Asset Inventory Valuation Summary

Asset	Total Replacement Cost	Cost Breakdown
Total AHEC Assets	$97,488,745	Buildings and vehicles - $5,000,000 Overhead assets - $78,411,410 Underground assets - $14,077,335
Distribution Lines	$57,912,428 OH $3,325,335 UG	OH Single-phase lines - $32,518,200 UG Single-phase lines – 1,626,135 OH Three-phase lines - $25,394,228 UG Three-phase lines - $1,699,200
Supporting Infrastructure	$20,498,982 OH $10,752,000 UG	Meters - $913,500 Poles - $8,610,750 OH Transformers - $5,863,200 UG Transformers - $10,752,000 Guys/Anchors - $1,203,619 Cross-arms - $1,223,689 Regulators - $944,803 SP Oil-Circuit Reclosures - $978,006 3phase Oil-Circuit Reclosures - $546,480 Capacitors - $214,935
Office Buildings	$2,000,000	
Warehouses	$1,000,000	
Vehicles	$2,000,000	
Source: Internal Atchison-Holt Accounting and Insurance records, 2021		

Ensuring quality distribution to its customers, Atchison-Holt maintains not only distribution lines, but also the supporting infrastructure as well. Table ? includes a list of asset types, emergency replacement cost per unit or mile, the asset inventory by Service County, and total infrastructure numbers.

ATCHISON-HOLT REC SURVEYS

AHEC Asset Inventory by Service County

Asset	Emergency Replacement Cost per unit or mile	Number of units or miles: ATCHISON	Number of units or miles: HOLT	Number of units or miles: NODAWAY	Total number of units or miles:
Meters	$350/unit	1,304	1,179	127	2,610
Poles	$450/unit	11,461	6,908	764	19,135
SP*** Distribution Line	55,000/mile OH** ($10.52/foot OH) $76,560/mile UG*** ($14.50/foot UG)	399 OH 18 UG	239 OH 19UG	27 OH 5 UG	665 OH 42 UG
TP**** Distribution Line	$95,600/mile OH ($18.11/foot OH) $120,000/mile UG ($22.73/foot UG)	106 OH 3 UG	67 OH 3 UG	6 OH	179 OH 6 UG
Transformers	$2,100 OH $24,000 UG	1,354 OH 170 UG	1,079 OH 131 UG	129 OH 12 UG	2,792 OH 448 UG
Guys/Anchors	$125/unit	5,733	3,440	382	9,629
Cross-Arms	$184/unit	4,045	2,428	269	6,680
Regulators	$21,395/unit	26	17	1	44
Oil Circuit Reclosures	$3,800 SP $44,000 TP	112 SP 4 TP	93 SP 4 TP	12 SP 1 TP	258 SP 13 TP
Capacitors	$3,500/unit	18	35	9	62
Total Replacement Value By County		$68,359,801 OH $3,642,000 UG	$61,959,550 OH $3,243,000 UG	$9,739,974 OH $489,000 UG	$140,059,325 OH $7,374,000 UG

**OH = overhead ***UG = underground ***SP = Single phase ****TP – Three phase

Source: Internal Atchison-Holt Accounting and Maintenance records

Risk Assessment

Please add any known information related to each of the natural hazards that follow: Flooding (Major and Flash), Levee Failure, Dam Failure, Earthquake, Land Subsidence/Sinkholes, Drought, Extreme Temperature, Severe Thunderstorms, Severe Winter Weather, Tornadoes, Wildfire

NWMORCOG will add information to the narrative from the National Weather Service that has occurred since 2016

Tornadic Event Summary

Date of Event	EF Scale Rating	Damage Estimates	Outages Reported
5/8/96	F1	$1,200	0
5/24/04	F1	$2,500	0
8/8/07	F0	$2,500	0
6/5/08	F0/F1	$2,500	0
9/9/14	EF0	$2,500	0
Data provided based on internal AHEC records which reflect cost from the referenced event year.			

Thunderstorm/High Wind, Hail Event Summary

AHEC Hail Event Damage Summary

Event Date	Damage Estimates	Outages Reported
5/14/96	$500	0
5/20/96	$1,000	0
8/19/96	$500	0
7/23/97	$2,000	0
5/19/98	$300	0
6/13/98	$800	0
5/26/00	$100	0
6/13/00	$800	0
6/23/00	$200	0
7/26/00	$1,000	0
4/5/01	$50	0
5/10/01	$300	0
7/3/01	$100	0
9/7/01	$800	0
4/18/02	$800	0
4/24/02	$1,000	0
5/6/02	$900	0
7/26/02	$250	0
4/15/03	$50	0
5/24/04	$2,500	0

ATCHISON-HOLT REC SURVEYS

Event Date	Damage Estimates	Outages Reported
6/12/04	$500	0
8/25/04	$3,000	0
8/26/04	$1,000	0
6/4/05	$200	0
3/21/07	$50	0
5/6/07	$500	0
8/8/07	$2,500	0
4/25/08	$500	0
5/24/08	$1,500	0
6/4/08	$50	0
6/5/08	$2,000	0
3/23/09	$180	0
6/1/09	$50	0
6/7/09	$50	0
8/19/09	$1,000	0
4/3/11	$200	6
6/27/11	$250	54
3/29/12	$2,700	16
4/17/13	$1,750	301
5/19/13	$6,000	167
5/28/13	$10,200	439
7/7/14	$250	26
5/25/15	$450	65
5/26/16	$500	4
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

AHEC Thunderstorm / High Wind Event Summary

Event Date	Damage Estimates	Outages Reported
7/19/96	$1,000	0
6/21/97	$1,500	0
7/23/97	$2,000	0
4/14/98	$1,000	60
5/15/98	$400	495
5/20/98	$1,500	5
4/5/99	$1,200	237
4/8/99	$2,000	1,810
6/27/99	$1,000	37
7/30/99	$2,500	338
6/13/00	$800	289
6/23/00	$200	46

ATCHISON-HOLT REC SURVEYS

Event Date	Damage Estimates	Outages Reported
8/19/00	$700	12
4/7/01	$0	312
4/11/01	$1,500	96
5/10/01	$300	1
7/18/01	$300	386
8/17/02	$500	117
4/15/03	$50	0
8/19/03	$50	72
5/22/04	$300	116
6/12/04	$500	43
8/25/04	$1,500	10
8/26/04	$1,000	121
6/28/05	$50	31
3/30/06	$1,200	467
8/8/07	$500	840
4/25/08	$500	48
6/5/08	$2,000	2,369
6/1/09	$50	4
8/4/09	$500	515
8/9/09	$50	174
7/18/10	$500	81
8/31/10	$1,200	71
5/11/11	$700	7
6/26/11	$7,500	434
8/6/11	$400	211
8/18/11	$700	68
5/18/13	$500	68
5/27/13	$8,700	138
9/19/13	$7,200	67
6/3/14	$2,100	75
9/9/14	$2,300	333
11/11/15	$200	132
7/7/16	$75,500	844
6/16/17	$606	328
8/20/17	$200	133
6/2/18	$530	349
7/10/21	$52,948	401
12/15/21	$33,393	1,092
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

The hazards of flood and levee failure have been separated in the Missouri State Hazard Mitigation Plan. If possible, separate any damage/outages data into the appropriate hazard's table.

ATCHISON-HOLT REC SURVEYS

Flood Event Summary

Event Date	Damage Estimates	Outages Reported
1993	$94,900	0
May 2007	$102,050	0
June 2010	$137,500	0
June 2011	$316,320	0
July 2016	$500	52
March 2019	$954,502	0
Data provided based on internal AHEC records which reflect cost from the referenced event year.		

Levee failure,

Event date	Damage estimates	Outages reported

Severe Winter Weather Event Summary

Event Date	Event Type	Damage Estimates	Outages Reported
2/9/01	Snow	$13,490	2,203
3/15/01	Snow	$1,200	395
1/3/05	Winter storm	$100	133
2/12/07	Snow	$1,500	0
12/1/07	Ice storm	$300	0
12/10/07	Ice storm	$335,695	1,500
11/16/09	Snow	$0	1,094
1/16/10	Winter storm	$2,500	237
2/1/11	Winter Storm	$300	25
11/9/11	Winter Weather	$1,650	271
12/20/12	Blizzard	$650	79
1/29/13	Winter Weather	$250	3
2/21/13	Winter Storm	$250	43
12/21/13	Heavy Snow	$400	2
2/1/15	Heavy Snow	$2,000	125
Data provided based on internal AHEC records which reflect cost from the referenced event year.			

Please add any dates, known damage, and outages since the last plan due to

dam failure,

Event date	Damage estimates	Outages reported

drought,

Event date	Damage estimates	Outages reported

earthquake,

Event date	Damage estimates	Outages reported

extreme temperatures (hot & cold)

Event Date	Event Type	Damage Estimates	Outages reported

land subsidence,

Event date	Damage estimates	Outages reported

or wildfire.

Event date	Damage estimates	Outages reported

Goals and Actions Survey

The original survey is an interactive Excel file that was emailed to the cooperative where it was reviewed and returned for this update to the Plan. A copy of the returned survey is provided here:

Complete each row left to right. Click on each box to receive instructions for that box.	**2017 Approved Goals**	**Reassess the goal**	**Instructions**
→	**Goal 1:** Protect the health and safety of the community	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.
→	**Goal 2:** Reduce future losses due to natural hazard events.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.
→	**Goal 3:** Improve emergency management capabilities and enhance partnerships.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.
→	**Goal 4:** Continue to promote public awareness and education.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.
↓	**After completing this sheet, please click the "actions" tab at the bottom, left**		

Table 1 *AHEC Hazard Risk Summary*

Hazard	Average Annual Damages
Flood and Levee Failure	$55,371
Severe Winter Weather	$18,014
Severe Thunderstorms, and High Winds	$5,160
Tornadoes	$361
Hail	$1,897
Earthquakes	$0
Dam Failure	$0
Wildfire	$0

Goal-Action#	Action Items	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
2-1	Raising transformers with pad mounts in flood prone areas.	Continue (In-progress)	We continue to invest in our physical plant annually to ensure the integrity of our system. We continue to do annual line inspection, pole inspection and infra-red inspection to identify and repair any issues in a timely manner. We also prioritize each item and track each job to completion.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	7
2-2	Upgrade to concrete or steel poles where possible.	Continue (Not started)	We are still assessing where this action would be prudent and reasonable. To date we have not implemented any of these actions, but are continuing to consider adding this to our construction work plans.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
1-1	Use vegetation management to prevent the public danger of downed lines	Continue (In-progress)	We continue to conduct annual vegetation management including but not limited to spraying, cutting and treating areas which may become impediments to the delivery of energy.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	8
	Complete annual inspections of lines and poles.	Delete this action	Annual routine procedures do not need inclusion in this plan	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather		8
2-3	Add alternate source wiring to eliminate or reduce time of outages.	Continue (In-progress)		Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	7
2-4	Convert overhead lines to underground lines or vice versa in troubled areas based on vulnerability.	Continue (Not started)	Due to the high cost and relative few places where this would be effective, we have not conducted any of these activities, but continue to research areas where it may be feasible to do so.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	1
4-1	Provide safety and reporting information to the general public: using local newspapers, through presentations and publications, through the company's website and/or social media sites.	Continue (In-progress)	During any severe outage event or any planned service interruption we notify our members with timely reporting with all media outlets at our disposal.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	6
1-2	Increase number of generators owned for use in critical asset outages.	Continue (Not started)	We do conduct periodic interviews with critical asset members to discuss options due to extended interruption of service.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2024	6

3-1	Maintain mutual aid agreements with other rural electric cooperatives.	Continue (In-progress)	We continue to work with our statewide agency to ensure we have the ability to receive and offer assistance to other cooperatives when necessary.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	9
1-3	Partner with county emergency management to ensure power for local shelters, fuel stations, and public safety.	Continue (In-progress)	We do solicit various local oranization to offer assistance with power for critical infrastructure in addition to severe weather events.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	6
3-2	Cooperate with local law enforcement and government officials to reduce the impact of power outages.	Continue (In-progress)	We have interaction with various local officials to discuss the impact of loss of power to critical infrastructure.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	6
2-5	Research methods for waterproofing meters in flood-prone areas.	Continue (Not started)	At present we are unaware that such technology exists to fully waterproof a meter enclosure.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
2-6	Collect GPS data for all existing infrastructure.	Action Completed	We have just recently completed the work of collecting all gps coordinates for the majority of our distri bution assets.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather		5
2-7	Utilize GIS technology to improve site identification and response time.	Continue (In-progress)	We have not used this technology to integrate with dispatching and fault location, but are researching opportunities.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2025	2
3-3	Consider implementation of automated voice response systems to improve outage reporting.	Continue (In-progress)	We continually seach for methods which would improve our after hours outage reporting.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2023	6
2-8	Monitor developments in data availability concerning the impact of dam failure and wildfire upon the service area through local, state, and federal agencies.	Continue (In-progress)	We do monitor websites that offer flood level prediction as to better understand the impacts of such weather events.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire	annually	6