Rural Electric Cooperative Hazard Mitigation Plan

INTRODUCTION

Rural electric cooperatives (RECs) are customer owned organizations whose purpose is to deliver electricity to its members. RECs were created to bring electricity to rural farms in the 1930's that were not serviced by investor-owned utilities (IOUs) at the time due to the cost to build the needed infrastructure compared to the number of customers and anticipated electricity demand. The revenue generated by these non-profit organizations is invested in electric infrastructure needed to serve customers in rural areas.

Twenty-five different electric cooperatives serve more than 380,000 homes and businesses in 77 of Ohio's 88 counties. There are twenty-four electric distribution cooperatives based in Ohio, and another, Midwest Energy Cooperative, based in Michigan that serves a small number of consumers in the Fulton County area. The Ohio Rural Electric Cooperative, Inc. (OREC) is the trade association of the non-profit RECs. The combined service area of these cooperatives is approximately 40 percent of Ohio's land area.

RECs in Ohio average seven residential customers per mile of line, in contrast to thirty-one customers for Ohio's eight IOUs. Table 1 lists the RECs that operate in Ohio and the miles of line and number of metered accounts for each. Figure 1 is a map of Ohio's REC Service Areas and location of important REC facilities.

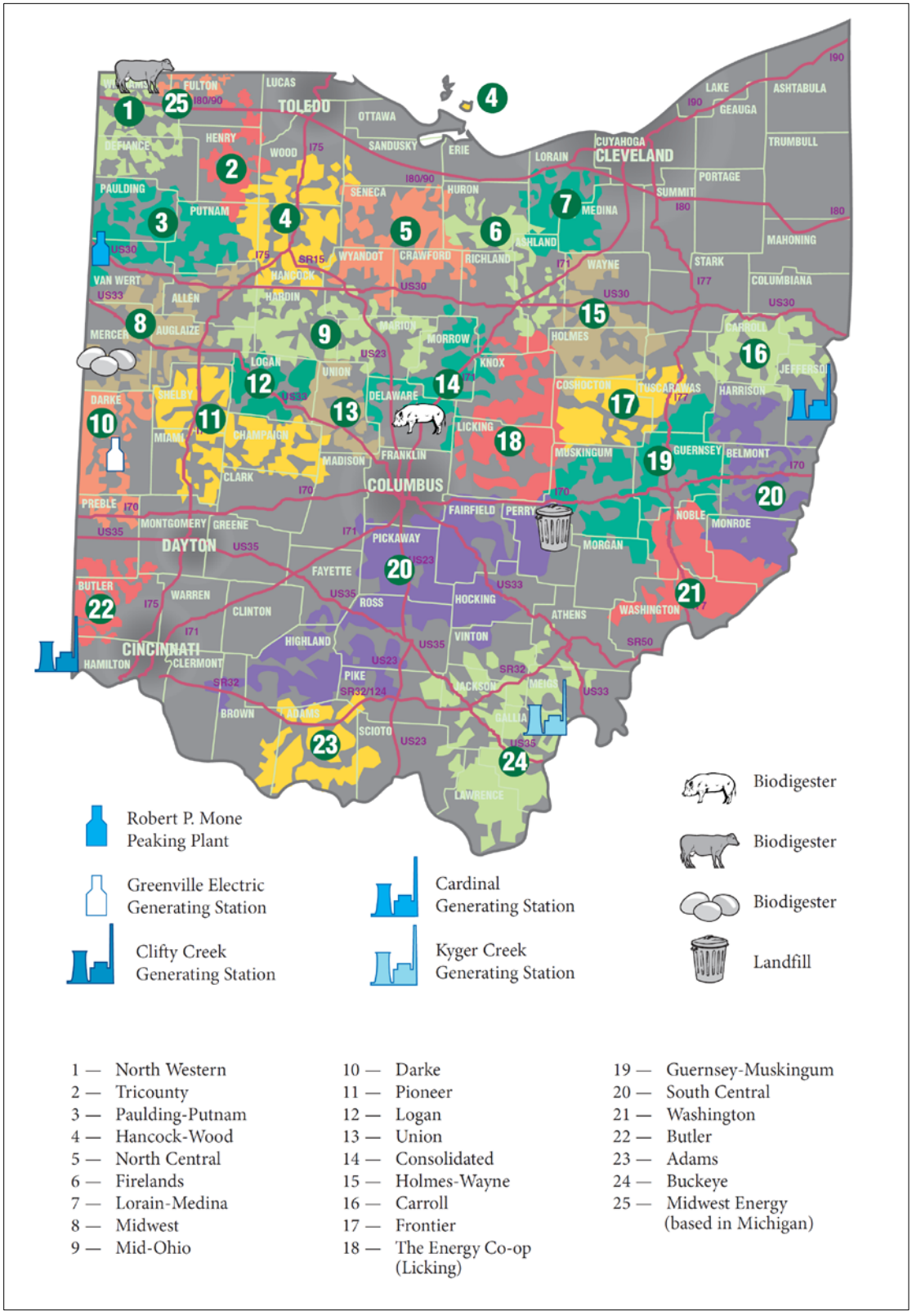
Table 1 - Ohio's Rural Electric Cooperatives

Name of Cooperative	Miles of Electric Line	Number of Metered Accounts
Adams Rural Electric	1,320	7,450
Buckeye Rural Electric	2,603	19,099
Butler Rural Electric	1,605	11,633
Carroll Electric	1,484	12,490
Consolidated Electric	1,872	14,298
Darke Rural Electric	871	5,081
Firelands Electric	992	9,006
The Frontier Power Company	1,541	8,973
Guernsey-Muskingum Electric	2,795	16,838
Hancock-Wood Electric	1,808	13,002
Harrison Rural Electrification	1,022	6,658

Holmes-Wayne Electric	2,242	17,008
Licking (d.b.a. The Energy Cooperative)	3,062	24,655
Logan County Electric	668	4,585
Lorain-Medina Rural Electric	1,529	16,116
Mid-Ohio Energy	1,328	8,125
Midwest Electric	1,590	10,531
Midwest Energy	120*	1,072*
North Central Electric	1,784	9,667
North Western Electric	1,052	5,868
Paulding-Putnam Electric	1,702	12,876
Pioneer Rural Electric	2,663	16,552
South Central Power	11,877	115,571
Tri-county Rural Electric	616	4,377
Union Rural Electric	994	8,739
Washington Electric	1,765	10,513
Total	50,905*	390,783*

* Includes only Ohio statistics

Figure 1 - Ohio's Rural Electric Cooperative Service Areas and Power Generating Stations



PLAN DEVELOPMENT

The development of this plan was a cooperative effort between the Ohio Emergency Management Agency Mitigation and Recovery Branch and the Ohio Rural Electric Cooperative, Inc. Power outages and utility infrastructure damage accompany the occurrence of many of Ohio's most frequent disaster events (wind, ice, and flooding). Power outages complicate the recovery process and damage to infrastructure can be timely and expensive to repair. The need for efforts to reduce hazard risk to power infrastructure is underscored when you examine recent data from FEMAs Public Assistance (PA) program. RECs have utilized the PA program to help pay the cost to repair infrastructure damaged as part of a major disaster declaration as defined by the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The table below summarizes Public Assistance grant costs to rural electric cooperatives as the result of six major disaster declarations in Ohio. The total cost to repair damaged infrastructure is $102,314,006.00.

FEMA Declaration Number	Date of Disaster Event	Event Type	Number of REC's Impacted	Total Cost
1453	February 2003	Ice	2	$18,141,650
1556	September 2004	Flood	1	$92,779
1580	December 04/January 05	Ice	18	$72,141,081
1805	September 2008	Wind	10	$3,153,796
4002	April/May 2011	Flood	1	$21,554
4077	June/July 2012	Wind	14	$8,763,146

Ohio's RECs are active mitigation partners and take many proactive steps to ensure that damages are minimized when disaster strikes. Some examples include: tree-trimming programs in power line right-of-ways, infrastructure maintenance plans and procedures, and consideration of known hazard areas when planning future improvements and expansions. Participation in this mitigation planning effort is further indication of REC efforts to enhance disaster resilience.

MITIGATION PLANNING OVERVIEW

Ohio EMA mitigation staff approached the OREC Engineers Association about the possibility of collaborating to develop an appendix to the State of Ohio Hazard Mitigation Plan. The Engineers Association is a subgroup of OREC whose members are responsible for design, construction and maintenance of their respective REC infrastructure. After conversations between Ohio EMA mitigation staff and the President of the Engineers Association, Ohio EMA Mitigation and Recovery Branch staff was invited to speak with the full Engineers Association at their semi-annual meeting. The first meeting occurred on May 2, 2013 and included

participation via conference call from the Federal Emergency Management Agency Region V Mitigation Planner.

The purpose of this meeting was to gauge the OREC's interest in collaborating with the Ohio EMA to develop an appendix to the SOHMP that would include a rural electric cooperative risk assessment and the identification of projects that will reduce risk to electric infrastructure and expedite recovery efforts. Agenda topics for this meeting included:

- An overview of the Ohio EMA Mitigation and Recovery Branch including mitigation planning and project programs
- A discussion of ongoing REC mitigation efforts, and
- FEMA overview of how other Midwest states have developed similar state plan appendices and successfully implemented electric infrastructure mitigation projects utilizing FEMA Hazard Mitigation Assistance funds

At the conclusion of the meeting, an informal poll was taken and the overwhelming majority of RECs indicated that they would be interested in participating in the planning process.

Ohio EMA participated in the Engineers Association fall meeting held on October 3, 2013. At this meeting, the group discussed alternative methodologies for REC risk assessment. It was decided that the methodology recommended by the National Rural Electric Cooperative Association would be used to estimate risk. The risk assessment process would be completed by each of the RECs and the data summarized in this plan appendix. The Engineers Association also decided to assemble a sub-group of five representatives from each area of the state to help facilitate the planning efforts in their respective areas. This sub-group also met with the OREC Chief Executive Officer group to secure their support of this mitigation planning effort.

The RECs completed their separate risk assessments in the fall and winter. The risk assessment information was compiled and a draft of the mitigation plan appendix sent to the Engineers Association for review in March 2014. Comments from the Engineers Association were incorporated into the final document.

The next step in the process was to identify and document mitigation actions that will reduce the risks identified in the risk assessment. A template was developed to collect mitigation actions from the REC's. The template summarized information for each mitigation action including: a brief description of the activity, location of the proposed action, estimated cost, priority ranking, and timeframe for completion. The template was emailed to the RECs and the collected data incorporated into this plan.

Mitigation and Recovery Branch staff met with the Engineer's Association again on April 3, 2014. The purpose of this meeting was to collect any outstanding risk assessment and mitigation action data for incorporation into the final draft. This meeting was also used to reach consensus on the mitigation goals identified as part of this planning effort. Shortly after this meeting, the final draft of this document was sent to the REC Engineers Association for final

review and comment. Ohio EMA incorporated the comments and the final document was sent to the Engineers Association for adoption.

Need a paragraph describing the REC adoption process in general.

HAZARD PROFILES

The Ohio EMA Mitigation and Recovery Branch maintains the State Hazard Mitigation Plan, which profiles the state's high risk hazards. Detailed information regarding the historic occurrence, probability of future events, and risk posed by these high risk hazards can be found in Section 2 of the State Hazard Mitigation Plan Hazard Identification and Risk Assessment: http://ohiosharpp.ema.state.oh.us/OhioSHARPP/Planning.aspx#ehmp. This information was reviewed and considered by the REC's while developing their risk assessments.

RISK ASSESSMENT METHODOLOGY

The risk assessment methodology utilized for the REC mitigation planning process was the IT Recovery Plan for Electric Cooperatives developed by the National Rural Electric Cooperative Association. Hazard profile information in the State Hazard Mitigation Plan, and each REC's past experience of hazard events informed the risk assessment. The risk assessment process used is described below.

The risk assessment software utilizes five worksheets to collect information from the user on the various types of hazards that might affect the REC, and six parameters that help to define each hazards risk. The worksheets ask the user to assess hazards that are categorized as "natural threats, human threats, and technical threats". The software provides an option for the user to add any hazards that may be specific to the REC being assessed. The software then asks the user to evaluate each hazard against the following parameters:

- Probability of Occurrence
- Speed of Onset
- Forewarning
- Duration
- Economic Impact
- Level of Concern

The criteria for each of these parameters are described in detail below.

Probability

Probability is expressed as the chance of an event occurring within the next five years. Table 2 summarizes the numeric scoring system used to rate the probability of occurrence. Hazards that are assigned a value of zero are not evaluated further.

Table 2 – Probability Criteria for Risk Assessment

Likelihood of Event Occurring within 5 Years	Chance Measured in Percentages	Value Assigned
Event not applicable	0%	0
Minimal likelihood	1-5%	1
Minor likelihood	6-20%	2
Moderately likely	21-50%	3
Highly likely	51-75%	4
Almost certain	Greater than 75%	5

Speed of Onset

Speed of Onset quantifies how quickly a threat can start using the criteria in Table 3.

Table 3 – Speed of Onset Criteria for Risk Assessment

Criteria	Value Assigned
Onset of threat is slow	1
Onset of threat is fast	2

Forewarning

Forewarning quantifies the amount of advanced notice to prepare for the impacts of the hazard using the criteria in Table 4.

Table 4 – Forewarning Criteria for Risk Assessment

Criteria	Value Assigned
Forewarning of threat is likely	1
Forewarning of threat is unlikely	2

Duration

Duration quantifies how long the threat will last based on the criteria in Table 5.

Table 5 – Duration Criteria for Risk Assessment

Criteria	Value Assigned
Duration of threat is short	1
Duration of threat is long	2

Economic Impact

The economic impact is measured by estimating the damage that might be caused by a particular hazard to the REC. There are three different tables for estimating economic impact

based on the number of customers served by the cooperative. Cooperatives with less than 10,000 members used Table 6. Cooperatives with 10,001 to 40,000 members used Table 7. Cooperatives with more than 40,000 members used Table 8.

Table 6 – Economic Impact Criteria for Cooperatives with Less than 10,000 Members

Economic Loss	Value Assigned
Less than $1,000	1
$1,001 - $5,000	2
$5,001 - $20,000	3
$20,001 - $50,000	4
Greater than $50,000	5

Table 7 – Economic Impact Criteria for Cooperatives with 10,001 to 40,000 Members

Economic Loss	Value Assigned
Less than $10,000	1
$10,001 - $50,000	2
$50,001 - $150,000	3
$150,001 - $250,000	4
Greater than $250,000	5

Table 8 – Economic Impact Criteria for Cooperatives with More than 40,000 Members

Economic Loss	Value Assigned
Less than $50,000	1
$50,001 - $250,000	2
$250,001 - $500,000	3
$500,001 - $1,000,000	4
Greater than $1,000,000	5

Level of Concern

Measures the cooperatives overall ability to respond to a hazard. The value is a composite score of several considerations including: past experiences, staff capability, available resources, and the magnitude of the threat.

Table 9 – Level of Concern Criteria for Risk Assessment

Criteria	Value Assigned
Not concerned	1
Somewhat concerned	2
Concerned	3
Very concerned	4
Extremely concerned	5

RISK ASSESSMENT RESULTS

Once the engineer has assigned values to each of the parameters above for every hazard evaluated, the software generates a relative risk score. This relative risk score is then used to rank hazards that pose the highest threat to the REC. Hazards with a higher numeric value represent a higher risk. The REC risk assessments indicate that high winds (70+ mph), ice storms, tornado's, blizzards and lightning are the hazards that pose the highest risk to REC infrastructure and operations. The highest ranking hazards identified as part of this risk assessment correspond well with the hazard ranking in the State Hazard Mitigation Plan hazard identification and risk assessment. Each REC considered their individual hazard ranking when developing mitigation actions.

MITIGATION GOALS

The mitigation goals identified in this plan are intended to set a direction for the overall mitigation efforts and actions of the REC's. The goals are broad statements of direction that guide development of the actions identified by the REC's that will reduce future risk. The Engineers Association considered and reached consensus on a common set of goals that are outlined below:

- Increase awareness of risk and utility infrastructure vulnerabilities to natural hazards.
- Minimize public safety concerns and power supply disruption to electric cooperative customers.
- Reduce or eliminate future damage to electric cooperative infrastructure and facilities.
- Improve local disaster recovery efforts.
- Support the coordination and collaboration of mitigation efforts among federal, state and local government and other interested parties.

REC MITIGATION ACTIONS

The mitigation actions listed below were developed by the RECs to mitigate future damage from hazards identified in the risk assessment. Each REC that participated in the planning process identified at least one action item. Each action item includes a brief description of the mitigation activity, estimated cost, estimated timeframe for completion, and a priority ranking (high, medium, or low). Each REC determined the priority for the mitigation actions that they identified. Some of the mitigation actions are eligible for funding through the FEMA Hazard Mitigation Assistance programs, others would require alternate funding sources.

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Acquire New 138kV Delivery at Mt Hermon Property and Construct 12.5/15/20MVA Sub - Add new source point for power, other sources have reliability issues, backfeed other source load and split existing load between sources	Guernsey County	$1,476,600	Medium	2017 – 2018
Acquire New 69kV Delivery at South Cumberland Substation to feed new Renrock Substation - Add new source point for power, split existing load between source points, allow for better isolation of outages in very remote AEP RecLands, reduce outage cause location time. Backfeed other source load.	Noble / Morgan / Muskingum Counties	$250,000	High	2014 - 2015
Construct New 3 Phase Tie Line Between Antrim and Newcomerstown Substations - Allow backfeed of load from each source.	Tuscarawas / Guernsey Counties	$500,000	High	2015 - 2016
Construct New 3 Phase Tie Line Between proposed Mt Hermon and Newcomerstown Substations - Allow backfeed of load from each source.	Tuscarawas / Guernsey Counties	$1,200,000	Low	2017 - 2018
Construct New 3 Phase Tie Line Between Senecaville and Antrim Substations - Allow backfeed of load from each source.	Guernsey County	$600,000	Medium	2018 - 2019

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Construct a new 3 phase 336 tie line between the Milton sub and the McArthur metering point service area.	Jackson/Vinton	$675,000	Medium	2015-2018
Rebuild 1140' Rupert Lake Crossing. Would be needed to complete the transfer of load in Above project. Wire and structures are very old with the conductors rusting.	Vinton	$150,000	High	2015-2018
Rebuild tie line between Pine Ridge and Beaver substations. The line does not have the capacity to carry the load during extreme hot or cold weather.	Jackson	$540,000.00	Medium	2015-2018
Rebuild the 21 line from Rutland Substation to Meigs feeder 25.	Meigs	$840,000.00	High	2015-2018
Convert 2.3 miles of 3-phase 4/0 ACSR to 336 ACSR in the first zone out of Baker Meter Point. Replaces aging 3-phase line and conductor out of Baker Meter Point, which serves 1138 customers.	Darke	$215,000	High	2016-2017
Build new Pike Substation. Add source supplied off different Tx system to mitigate storms, power supply, vandalism.	Coshocton	$1.5M		2017-2018
Build new Keene Substation. Add source supplied off different Tx system to mitigate storms, power	Coshocton	$1.5M		2020-2021

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
supply, vandalism.				
Construct Tie line between Stone Creek & Auburn substations to improve backfeed between alternate sources.	Tuscarawas	$330k		2015-2015
Construct Tie line between Bakersville and Manning substations to improve backfeed between alternate sources.	Coshocton	$400k		2017-2017
Construct Tie line between Lafayette and Jackson substations to improve backfeed between alternate sources.	Coshocton	$830k		2017-2018
Install SCADA system to improve recovery response times.	Coshocton/ Tuscarawas	$500k		2014-2017
Convert 6 miles of 3 phase overhead line to underground line. Van Buren Substation ties to 5 other substations and the Hancock County Landfill Generating Station. Lines is in farm fields and wooded areas without road access.	Hancock, Wood	1,050,000	High	2019

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Convert 1 mile of 2 Phase Overhead to underground, Mount Cory South Circuit. Line is in wooded area along roadway.	Hancock	122,000	Low	2017
Convert 1.25 miles of 3 phase overhead line to underground line. Mount Cory South Circuit. Line is in farm fields and wooded areas without road access.	Hancock	218,750	Medium	2018
Construct Systemwide Communication Fiber Ring connecting all delivery points - The stability will allow us to remotely back feed and reroute power during large scale outages thus greatly reducing outage lengths. Affects all consumers, roughly 16,000.	Lorain, Medina and Ashland Counties	$869,500	Medium	2019-2020
Acquire New 138 kV Delivery Point to Construct a Northeast 12/16/20 MVA distribution substation - The new substation and associated transmission line tap will provide backfeed capability, thereby increasing reliability, between Robson Road, Camden and Baird substation areas, and will mitigate excessive low	Lorain County	$4,050,000	Low	2018-2019

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
voltage drop conditions as loads grow, affecting about 2900 consumers.				
Construct New Three Phase 556 MCM ACSR Tie Line Between Camden and Robson substations - Construction of this tie line between Robson Road and Camden substations provides one of two needed alternate major tie lines for backfeed and shorter distances between substations, affecting about 2400 consumers.	Lorain County	$72,500	Medium	2017-2018
Construct New Three Phase Tie Line Between the Webster and Robson Substations - Allow backfeeding of load from each delivery point, increasing reliability to about 3600 consumers.	Lorain County	$250,000	Medium	2015-2016
Construct New Three Phase Tie Line Between the Troy and Nova Substations - Allow backfeeding of load from each delivery point, increasing reliability to about 1700 consumers.	Ashland and Lorain Counties	$147,000	Medium	2016-2017

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Construct New Three Phase Tie Line Between the Nova and Brighton Substations - Allow backfeeding of load from each delivery point, increasing reliability to about 1100 consumers.	Ashland and Lorain Counties	$440,700	Low	2017-2018
Acquire New 138 kV Delivery Point to Construct a Carlisle 12/16/20 MVA distribution substation - The new substation and associated transmission line and transmission line tap will provide backfeed capability, thereby increasing reliability, between Robson Road and Litchfield substation areas, and will mitigate excessive low voltage drop conditions as loads grow, affecting about 3700 consumers.	Lorain County	$2,575,000	Medium	2016-2017
Construct Systemwide Communication Fiber Ring connecting all delivery points - The stability will allow us to remotely back feed and reroute power during large scale outages thus greatly reducing outage lengths. Affects all consumers, roughly 10,000.	Seneca, Wyandot, Crawford and Huron Counties	$1,100,000	Medium	2019-2020

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Acquire New 138 kV Delivery Point to Construct a North Tiffin 12/16/20 MVA distribution substation - The new substation and associated transmission line tap will provide backfeed capability, thereby increasing reliability, for consumers on Republic substation, affecting approximately 1500 consumers.	Seneca County	$2,000,000	Medium	2018-2019
Construct New Three Phase Tie Line Between Carey and Sycamore substations - Allow backfeeding of load from each delivery point, affecting about 2200 consumers.	Wyandot County	$352,800	Medium	2015-2016
Construct New Three Phase Tie Line Between the North and South Circuits of Nevada Substation - Allow backfeeding of load from each feeder, affecting about 700 consumers.	Wyandot County	$352,800	Medium	2016-2017
Construct New Three Phase Tie Line Between the North and West Circuits of Republic Substation - Allow backfeeding of load from each feeder, affecting about 800 consumers.	Seneca County	$504,000	Low	2018-2019

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Construct New Three Phase Tie Line Between the South and West Circuits of Carey Substation - Allow backfeeding of load from each feeder, affecting about 600 consumers.	Wyandot County	$428,400	Low	2016-2017
Construct New Three Phase Tie Line Between Carey and Seneca substations - Allow backfeeding of load from each delivery point, affecting about 2000 consumers.	Seneca County	$403,200	Low	2017-2018
Acquire New 138 kV Delivery Point to Construct a Fostoria 12/16/20 MVA distribution substation - The new substation and associated transmission line tap will provide backfeed capability, thereby increasing reliability, for about 900 consumers on Bascom substation.	Seneca	$2,000,000	Low	2019-2020

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Acquire New 69 kV Delivery Point to Construct Adrian 12/16/20 MVA distribution substation - The new substation and associated transmission line tap will provide backfeed capability, thereby increasing reliability, between Carey, Seneca, and Sycamore substations, affecting about 3000 consumers.	Wyandot County	$1,750,000	Medium	2016-2017
Acquire New 69 kV Delivery Point to Construct Flat Rock 12/16/20 MVA distribution substation - The new substation and associated transmission line tap will provide backfeed capability, thereby increasing reliability, between Republic substation and FlatRock meter point, affecting about 1900 consumers.	Seneca County	$1,750,000	Low	2017-2018
Relocate storm damage sections of line out of Wayne National Forest for better access, less damage, easier maintenance, and faster restoration	Washington/Monroe	$500,000	High	2015-2020
Relocate Rinard Mills Substation out of the flood zone. Water has flooded the station a few times.	Monroe	$2,000,000	Medium	2018

Mitigation Action Description	County Where Proposed Action is Located	Estimated Cost in 2014 Dollars	Priority Ranking (H, M, L)	Estimated Timeframe for Project Completion
Rebuild circuit between Rinard Mills Station and Fly Metering point for back-feeding the SR800/Fly area during extended outages	Monroe	$1,900,000	High	2016-2017
Construct 4.5 miles of new three phase tie line between Cooper Substation and Coldwater Metering Point - Allow backfeed of load from each source	Midwest Electric, Inc. - Mercer County	$744,300	High	2015
Rebuild 5.0 miles of three phase line with three phase double circuit between Sharpsburg Substation and Cooper Substation - Allow backfeed of load from each source	Midwest Electric, Inc. - Mercer County	$1,050,000	High	2015
Install 0.2 miles of three phase primary underground - Provide loop feed to Food Processing Plant	Midwest Electric, Inc. - Mercer County	$60,800	Low	2015

PLAN MAINTENANCE PROCESS

The Ohio EMA will meet with the OREC Engineers Association on an annual basis to solicit updates to risk assessments, mitigation actions, and any other portion of the plan. Changes to the plan can be submitted by REC's to Ohio EMA anytime. Any changes submitted to Ohio EMA between annual meetings will be reviewed at the annual meeting before the plan update is finalized.

SOURCES

1. 2013 Directory Ohio's Electric Cooperatives. Ohio Rural Electric Cooperatives, Inc. 2013
2. Buckeye Power Inc. http://www.buckeyepower.com/
3. National Rural Electric Cooperative Association. http://www.nreca.coop/
4. Ohio Rural Electric Cooperatives. http://www.ohioruralelectric.coop/
5. State of Wisconsin Hazard Mitigation Plan. Appendix G: Rural Electric Cooperative Annex