BIL 40101(d) Application

Project Title: Three Phase Line Replacement

Applicant: Slope Electric Cooperative

Date of Application: 9/30/2024

Amount of Grant Request:
$670,000

Total Amount of Proposed Project:

$900,000

Duration of Project:

3 years including waiting for material

Point of Contact (POC):

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Bismarck, ND 58503

North Dakota Transmission Authority

North Dakota Industrial Commission

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Applicant Description

Slope Electric Cooperative, Inc. (Slope) provides electricity to rural members in Bowman, Adams, Slope, and Hettinger Counties in south-western North Dakota. Slope has an office in New England, North Dakota and an outpost in Bowman, North Dakota. Slope's service territory is approximately 4,509 square miles and serves roughly 4,530 meters. The Cooperative owns 94 miles of transmission lines, 2,275 miles of overhead distribution line, 737 miles of underground distribution, and 18 distribution substations and 3 transmission substations. The Cooperative sells less than 230,000 MWhs per year. The location of Slope's service territory is shown below in Figure 1.

Slope's membership consists of roughly 75% rural residential accounts and 25% small and large commercial accounts. Slope's service area has a small pocket of oil drilling that peaked around 2010 and has seen a slow decline in energy sales since. Adam's County is considered a Partially Disadvantaged Community according to the Justice40 Screening Tool. In prior years, Hettinger County has also been considered a Disadvantaged Community but was not listed as a DAC on the most recent Whitehouse.gov website. Both counties have continued to see declining populations, low-income levels, and low education levels.

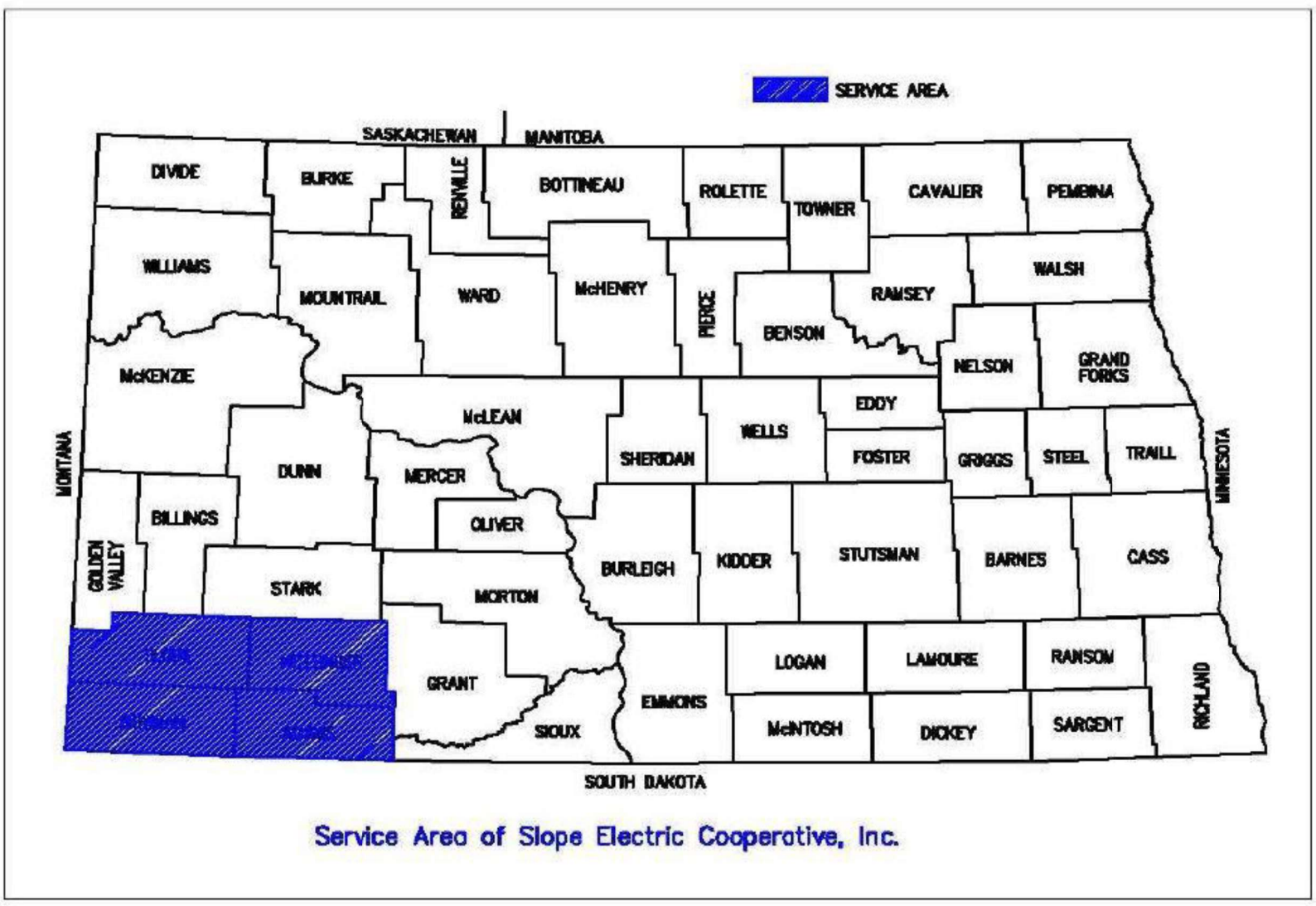


Figure 1: Slope Electric Cooperative Service Area

Project Description

Slope intends to replace the 115kV high-side fuses at their Centipede Substation with a 115kV circuit switcher. The cost to replace the 115kV high-side fuses is approximately $9,000 every time there is an operation. The duration of time out will be significantly less with a circuit switcher. The location of the high-side circuit switcher is shown in Table 1.

Table 1: Centipede Substation Circuit Switcher

Substation	# Meters Impacted	T/R/S	County	State	DAC
Centipede	235	T132N R96W S15	Adams	North Dakota	Partially

Slope also intends to install five 3-way pad mounted Cooper Vacuum Fault Interrupters (VFI) switchgear between substations to allow for improved switching capabilities during planned and unplanned outages. The switchgear will be equipped with motor operators to allow Slope to operate remotely once their SCADA system is implemented. This will reduce frequency of outages mostly due to planned work and will reduce duration of outage with increased switching capability. The locations of the VFIs are show in Table 2.

Table 2: Vacuum Fault Interrupter Locations

Substation-Circuit #	# Meters Impacted	T/R/S	County	State	DAC
Centipede Ckt #2/Haynes Ckit #1/Mott Ckt #4	241	T132N R94W S19	Adams	North Dakota	Partial
Centipede Ckt #2/Haynes Ckt #1/ Cedar Butte Ckt #4	195	T130N R96W S6	Adams	North Dakota	Partial
Haynes Ckt #2/Cedar Butte Ckt #3	144	T129N R93 S13	Adams	North Dakota	Partial
Centipede Ckt #3/ Haynes Ckt #4	220	T130N R95W S33	Adams	North Dakota	Partial
Centipede Ckt #4/Reeder Ckt #1	144	T132N R98 S22	Adams	North Dakota	Partial

Standards of Success

Objective 1: Reduce the magnitude and duration of grid outages caused by major disruptive storm and non-storm events.

This project will meet Objective 1 by reducing the duration and cost of outages on the Centipede Substation as restoring an outage with a high-side circuit switcher is quicker than replacing each high-side fuse link after an operation. The cost of each fuse link is roughly $3000, so each operation where a fuse blows results in a minimum of $9000 just in fuse link costs.

Installing three-way pad-mount smart VFIs will reduce the duration of outages as switching can be done remotely in many instances instead of having to drive hours to physically do switching. The Cooper VFIs are being installed in the far eastern area of Slope's system which is the furthest away from both of Slope's office and outpost locations.

Objective 2: Reduce the frequency and impacts of grid outages caused by major disruptive storms and non-storm events.

This project will meet Objective 2 similarly to how it meets Objective 1. The smart VFIs can be remotely operated through SCADA reducing the frequency of outages due to planned maintenance. In addition, the VFIs can collect and record fault and loading information that can be used to make informed decisions. The fault information can be analyzed to determine what is causing the interruptions allowing potential repairs to be made to reduce the frequency of interruptions.

Objective 3: Implement grid modernization projects to develop energy solutions to provide lower-cost energy access to disadvantages or underserved communities.

This project is expected to positively impact a total of 868 meters in Adam's County, which is classified as a Partially Disadvantaged Community according to the Justice40 Initiative. This project will give the cooperative more flexibility in coordination for increased loading due to EVs as well as possible two-way power flow due to increases in solar generation and other distributed generation sources. In addition, this project will result in shorter outages, less overtime hours, less truck rolls, and less maintenance costs for the cooperative. Reduced costs for the cooperative positively impacts membership power costs. Reduced frequency and magnitude of power outages positively impacts area businesses and agricultural operations as well.

All of the improvements will take place either within existing substation yards or within existing utility right of way. No new ground will be disturbed. Due to no new ground being disturbed, work being done in existing right of way and within existing substations, CFR1970.53 (d)(10) applies and no environmental report should be needed.

It is estimated that Slope will utilize 2-3 contract individuals (temporary) to install the Cooper smart Vacuum Fault Interrupters and 115kV circuit switcher, 2 engineers (mostly temporary), and 4 line workers (existing) to plan for and program the devices. The contractors and engineers will be needed for maintenance and troubleshooting for the life of the devices but are not expected to be retained full-time.

Project Timeline

Slope plans to order all devices after grant approval and will replace the Centipede circuit switcher within 12 months of receiving the equipment. The Cooperative will install the VFIs within 18 months of receiving the devices. It is expected there will be a roughly 12-month lead time on all equipment.

Project Budget

The total project cost is estimated to be 900,000. That total is made up of $150,000 for the Centipede 115kV circuit switcher and $150,000 for each of the VFIs. This includes cooperative or contract labor to install new devices and retire existing devices. It also includes engineering services to plan for optimal device placement, device settings, and programming of the new protective devices.

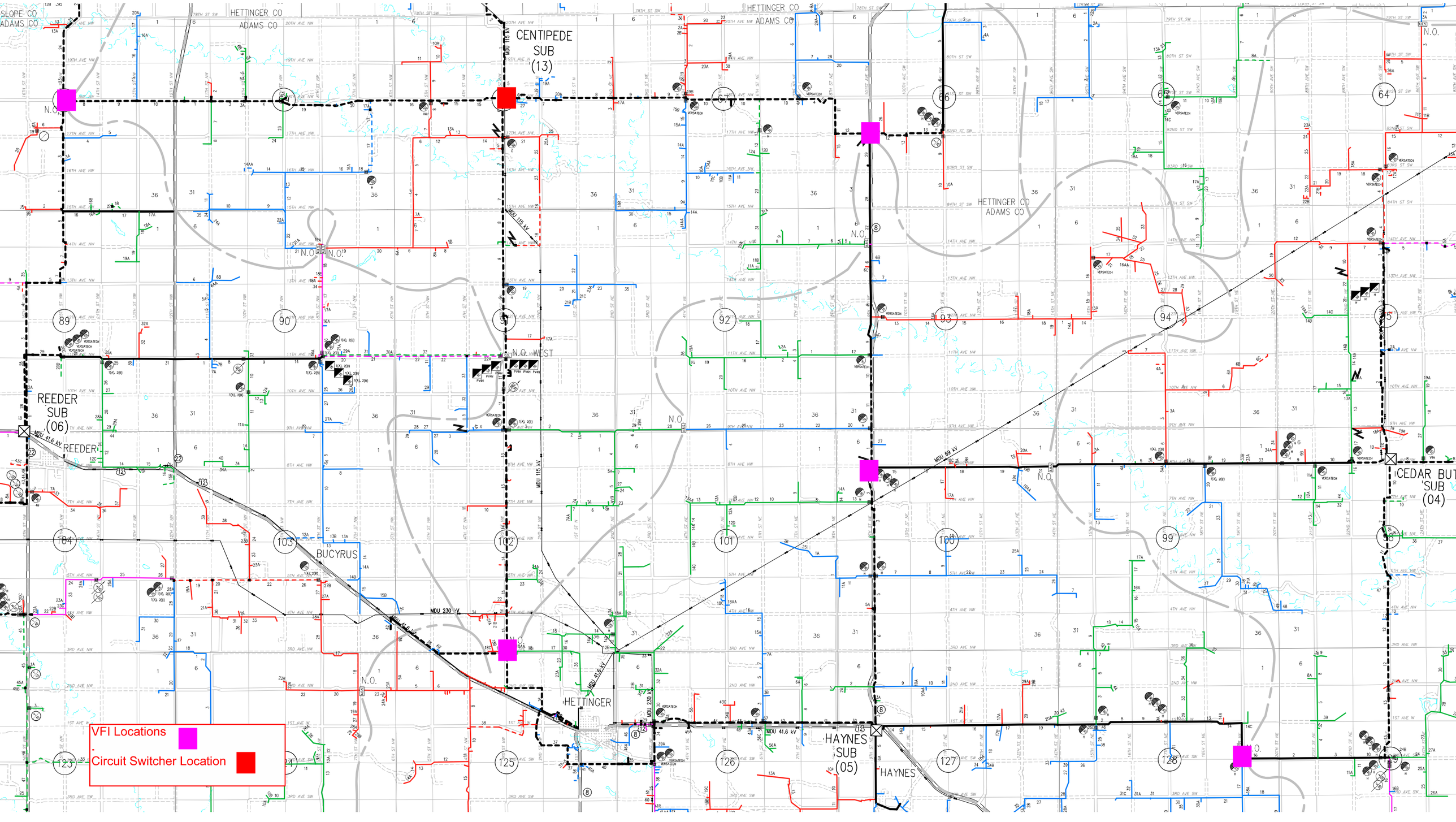
Build American/Buy American

Slope Electric Cooperative is a current RUS borrower and thus follows Build American/Buy American. However, if for whatever reason the manufacturers of the products are not certified in Buy American, Slope will follow the proper path to apply for waivers or choose a certified Build American/Buy American manufacturer that offers similar devices.

Davis Bacon Act

Slope's line crew are members of the IBEW Union and are paid wages and benefits not less than the prevailing wage in the local area. Union contracts can be furnished if required.

Appendix A – Project Exhibits


CENTIPEDE SUB (13)
MDU 115 kV
REEDER SUB (06)
MDU 41.6 kV
BUCYRUS
MDU 230 kV
HETTINGER
MDU 41.6 kV
HAYNES SUB (05)
HAYNES
MDU 69 kV
CEDAR BUT SUB (04)
HETTINGER CO
ADAMS CO
SLOPE CO
N.O. WEST
VFI Locations
Circuit Switcher Location

Appendix B – DAC Exhibit Exports

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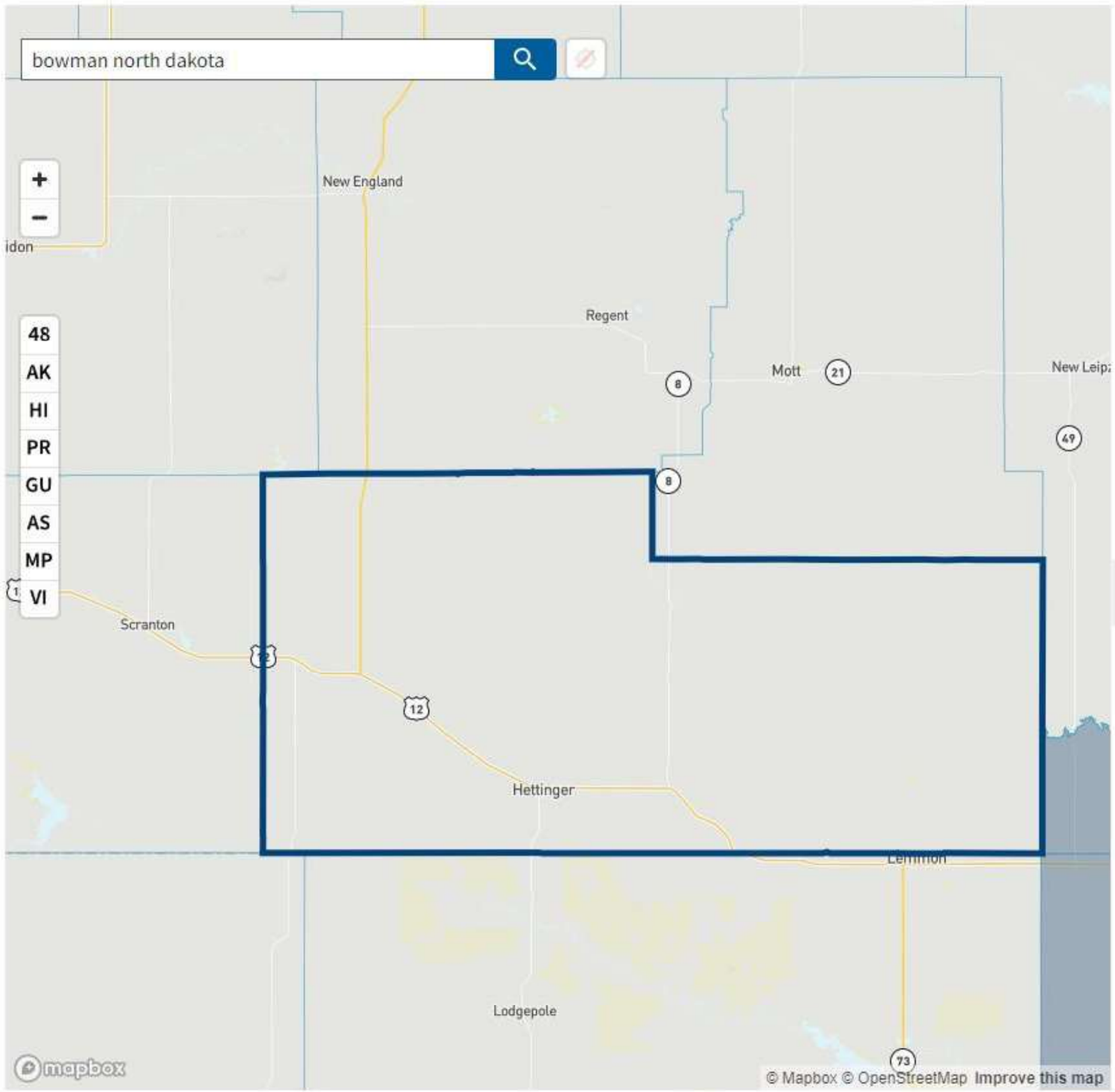


Tract information
Number: 38001965600
County: Adams County
State: North Dakota
Population: 2,311

Tract demographics
Race / Ethnicity (Show)
Age (Show)

Identified as disadvantaged?
PARTIALLY

The lands of Federally Recognized Tribes that cover less than 1% of this tract are considered disadvantaged.

Send feedback

Climate change —

Expected agriculture loss rate Economic loss to agricultural value resulting from natural hazards each year	74th not above 90th percentile
Expected building loss rate Economic loss to building value resulting from natural hazards each year	86th not above 90th percentile
Expected population loss rate Fatalities and injuries resulting from natural	95th above 90th percentile

U.S. territories note

Appendix C – Project Manager Resume

Trisha Samuelson

Manager of Engineering
1600 E. Interstate Ave, Suite 2
Bismarck, ND 58503
701-989-4551, tsamuelson@iea.coop

Education

University of Mary, Bismarck, ND
Master of Science in Business (MSB), Business, 2019-2021

North Dakota State University, Fargo, ND
Bachelor of Science in Engineering, Engineering, 2004-2006

Bismarck State College, Bismarck, ND
Associate of Science, General, 2002-2004

Training

- Licensed Professional Engineer in ND
- NRECA Supervisor and Management Development Program Certificate

Professional Experience

Innovative Energy Alliance Cooperative (IEA) – Bismarck, ND (2012-current)

Manager of Engineering (2018-current)

Responsible for overseeing IEA's engineering department and ensuring all four IEA member cooperatives are operating and complying with NESC and RUS standards. This includes overseeing construction work plans, line design, substation construction, and maintenance plans and developing annual construction budgets.

Assistance Engineering Manager (2016-2018)

Responsible for performing or overseeing construction work plans and other electrical system studies. In addition, this position is responsible for providing assistance and direction to IEA's engineering department as well as IEA's four-member cooperatives.

System Engineer (2012-2016)

Responsible for performing system studies like construction work plans, long-range plans, sectionalizing studies, and daily operational questions. This position also coordinated with outside consultants for substation and transmission line design and construction.

HDR Engineering, Inc. – Bismarck, ND (2006-2012)

Engineering Supervisor (2009-2012)

Responsible for overseeing electrical system studies, managing workload for the Bismarck, ND engineering planning department, and mentoring three younger electrical engineers. This position worked hand and hand with operations personnel at client rural electric cooperatives as well.

System Engineer (2006-2009)

Responsible for assisting or completing electrical system studies such as construction work plans, long range plans, sectionalizing studies, and motor starting analysis. This position also worked daily with Operations Managers or Line Superintendents at rural electric cooperatives across North Dakota.

Appendix D – Cooper Smart Vacuum Fault Interrupters

COOPER POWER
SERIES

Smart VFI switchgear

Expand protection, control and communications capabilities

Easily incorporate Eaton's Cooper Power™ series Smart VFI switchgear with integrated control options into your distribution automation system.

This easy-to-use intelligent switchgear not only saves time and money, but is built to quickly adapt to technological advances you can expect from your distribution automation system.

Reliability demands continue to increase on medium-voltage distribution systems. Critical loads such as data centers, entertainment districts and hospitals need dependable, reliable power delivery. Renewable distributed generation sources need a stable means of connecting to the utility grid with a way to monitor the connection. Automation is a strategy to carry these loads with feed redundancy, remote monitoring and advanced protection capabilities. By integrating Eaton's Cooper Power series VFI underground distribution switchgear with our field-proven automation solutions and drawing on our expertise and breadth of products, we have created Smart VFI solutions for customers with these demanding requirements.

Smart VFI switchgear combines advanced tap and loop protection with metering, SCADA functionality, and highly flexible and powerful automation capabilities in a single integrated package—reducing downtime and boosting overall reliability. The flexibility of the graphical ProView™ software with the Idea Workbench™ application allows the control to adapt to future requirements. Smart VFI switchgear provides the best integrated solution for your distribution automation needs.

- Save time and money with quick fault location and efficient grid restoration
- Easily integrate into your distribution automation system with a single, economical, integrated package
- Customized solutions to fit your needs
- Easy-to-use controls with common look and feel of other Cooper Power series controls
- Green alternative to SF_6 gas when filled with E200™ dielectric fluid
- Support and services groups to assist with all aspects of your project such as protection studies, site commissioning and future upgrades
- Developed, tested and supported from a single source
- Motor-operated interrupters and switches allow opening and closing to occur without entering the high-voltage compartment—significantly reducing arc flash exposure

Powering Business Worldwide

Smart VFI underground distribution switchgear saves time and money

- Minimize duration and area of outage with quick fault location and isolation
- Minimize crew time needed to locate faults and reconfigure and restore the grid
- Eliminate time and cost of mandatory SF_6 monitoring and reporting when E200 dielectric fluid is used
- Reduce cost and footprint when compared to metal-clad switchgear—up to 40% savings
- Reduce cost and clutter of external sensing with internal potential and current transformers
- Minimize maintenance with sealed deadfront construction

Easily integrate into your distribution automation system

Eaton's Cooper Power series Edison™ Idea™ relay and control platform paired with ProView software provides easy integration, control and monitoring:

- Enhanced remote communications with SCADA compatibility via DNP3 or Modbus®
- Remote Terminal Unit (RTU) functionality included in Idea control platform—no need for separate RTU
- Graphical communications mapping with Communications Workbench
- Integrated motor control
- Integral current and voltage sensing
- Comprehensive metering functions
- Monitoring information and data can be pulled into control system
  - Assists in evaluating energy consumption and trends in a compact, economical outdoor package
  - Trending information can be recorded by customer-configurable Data Profiler in control or communicated to SCADA system

Customized solutions to fit your needs

Eaton's Cooper Power series Smart VFI switchgear provides the ability to create your customized equipment package for many applications including:

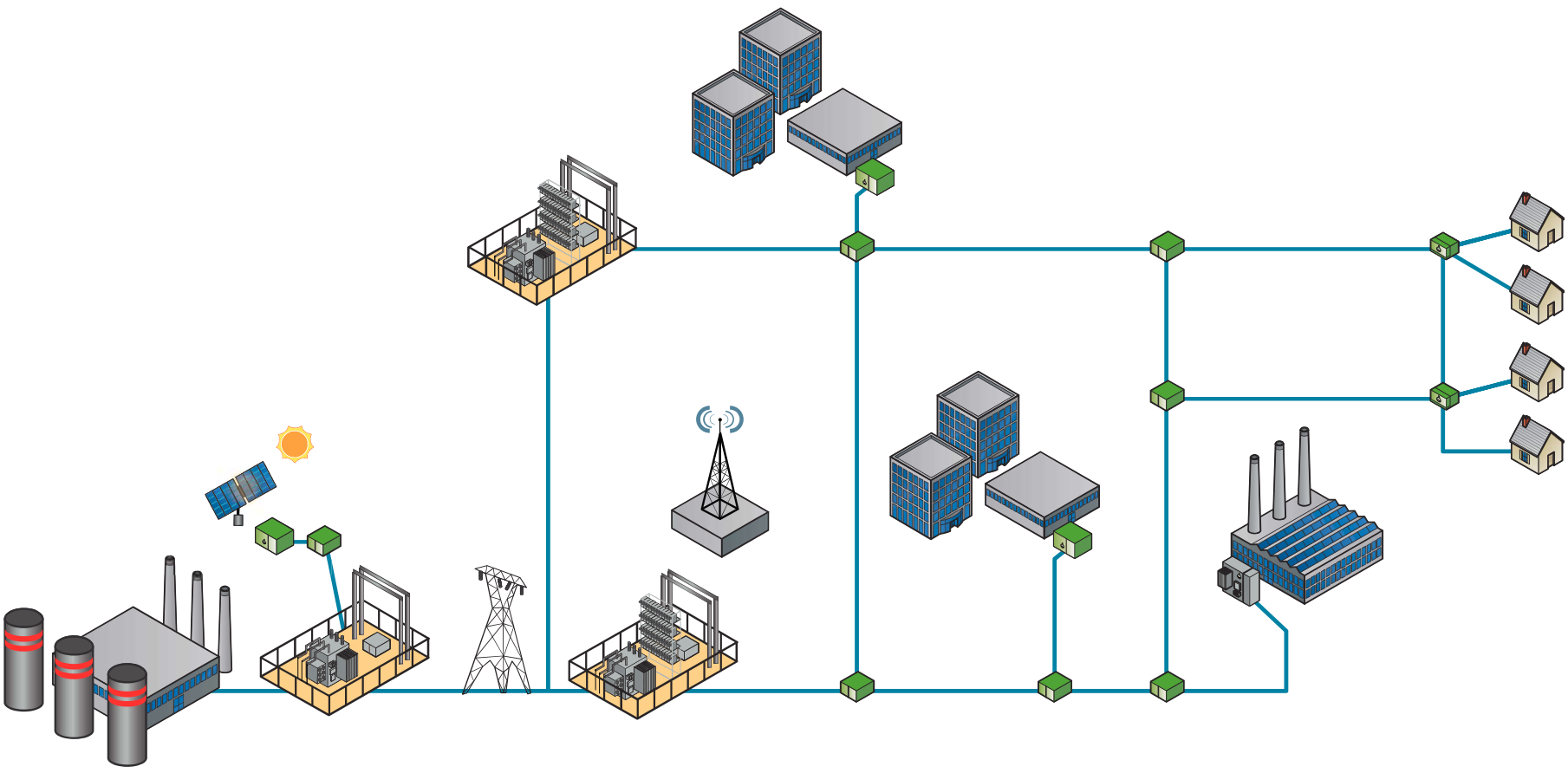
- Distribution automation/SCADA
- Self-healing grid
- High-speed fault isolation on loops
- University, military, institutional and government campuses
- Solar and other distributed generation grid-tie applications
- Data centers, hospitals and high-tech manufacturing
- Entertainment districts
- Feeder automation

Switchgear and control innovation and expertise

With more than 60 years of history designing and manufacturing switchgear, relays, underground distribution equipment and automation products for the Smarter Grid, Eaton has the experience and expertise to help you automate your underground system.

All Smart VFI switchgear is designed, tested and supported from a single source with unmatched expertise in underground distribution products and distribution reliability solutions.

Typical loop application



Easy-to-use control options

All Eaton's Cooper Power series Edison Idea relays and controls use ProView application software, the same powerful, easy-to-use platform used by the Form 6 recloser control. The Idea Workbench, a revolutionary graphical software programming environment, is a feature of ProView that permits the user to add additional protection and control functionality to any Edison Idea relay or control by means of downloadable custom software modules. This ability provides a continuous upgrade path that not only protects the initial investment in the relay, but also provides a means to increase the control's functionality in response to changing regulatory, power quality and reliability concerns.

Additional features include:

- Easy to set and program with ProView application software and Communications Workbench
- Customizable schemes
- Advance notice of pending cable splice failures with patented Incipient Cable Splice Fault Detector (ICSF)
- Real-time data
- Integration with SCADA systems
- Remote metering and switchgear control
- Simplified local motor operator interface

VFI underground distribution switchgear

VFI underground distribution switchgear provides superior overcurrent protection through the use of proven, reliable Cooper Power series vacuum interrupters. The resettable VFI interrupter allows immediate service restoration, eliminating the added expense and downtime associated with stocking and replacing fuses.

Additional switchgear features include:

- Environmentally preferred
- Biodegradable E200 dielectric fluid
- Operator safety
- High fire-point fluid
- 100% Deadfront construction
- Internal visible-break and ground option
- Switches and interrupters are hotstick operable
- Available side-mount operators allow external operation of switchgear
- Vacuum interruption maintains dielectric integrity by interrupting in the vacuum—not the dielectric medium
- Sealed insulation system protects internal components from contaminants
- Versatile customized designs

Smart VFI control options

Smart VFI switchgear with single-phase or three-phase protection and resettable vacuum fault interrupters is available with multiple control options including:

- iTAP-260 and iTAP-265 relays for dual overcurrent protection, monitoring and automation
- iDP-210 relay is an advanced metering and protection package designed for applications such as feeder protection, reverse power, overcurrent, under/overvoltage and frequency. In addition, the iDP-210 relay facilitates remote operation and monitoring

All options are fully integrated and designed as complete systems with testing and support of the switchgear and control from Eaton, eliminating interface issues.

Protection, remote terminal unit, motor control and metering provide a single integrated solution for your automated system.

The Smart VFI green solution

Biodegradable E200 fluid is a clear, low-viscosity fluid with excellent thermal and dielectric properties across the full temperature range for switchgear. All of this combined with a fire point greater than 300 °C makes E200 fluid ideally suited for switchgear applications.

E200 fluid is the environmentally preferred choice for VFI switchgear:

- Eliminates the need for SF_6 gas and associated regulations
  - Identified as one of the most potent greenhouse gases by the United States Environmental Protection Agency
  - One pound of SF_6 gas has the same global warming impact as 11 tons of CO_2
  - Relatively low emissions of SF_6 gas may have a large and lasting impact
  - Load and fault interruption in SF_6 gas produces toxic byproducts
- Advantages over solid dielectric options
  - Reduce cost and clutter of external sensing
  - Simple, safer operation with integral visible break and ground

Smart VFI solution support

Eaton provides a single point of contact with experts on-call.

- Switchgear Support Group (SSG) is dedicated to providing answers to your technical questions and after-sales support.
  - Phone: 800.497.5953
  - Email: PSSM-SSG@Eaton.com
- Eaton's Electrical Engineering Services & Systems provides a full suite of services including:
  - Startup and commissioning equipment
  - Perform planned maintenance
  - Monitor performance
  - Coordination studies
  - Arc-flash studies
  - Turnkey projects
  - For more information or emergency service contact:
    Phone: 800.498.2678
    Web: Eaton.com/service

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