North Dakota Transmission Authority

North Dakota Industrial Commission

BIL 40101(d) Application

Project Title: Sectionalizing and Protective Devices

Applicant: Mor-Gran-Sou Electric Cooperative

Date of Application: 9/28/2024

Amount of Grant Request:
$542,000

Total Amount of Proposed Project:

$728,000

Duration of Project:

3 years including waiting for devices

Point of Contact (POC):

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Applicant Description

Mor-Gran-Sou Electric Cooperative, Inc. (MGS) provides electricity to rural members in Grant, Sioux, and Morton Counties in south-central North Dakota. MGS has an office in Mandan, North Dakota along with an office in Flasher, North Dakota and Ft. Yates, North Dakota. MGS's service territory is approximately 4,800 square miles and serves roughly 10,263 meters. The Cooperative owns 243 miles of transmission lines, 2,599 miles of overhead distribution line, 873 miles of underground distribution, and 20 distribution substations. The Cooperative sells less than 175,000 MWhs per year. The location of MGS's service area is shown in Figure 1 below.

MGS's membership consists mostly of rural residential meters with the majority of the rest of the meters being seasonal residential (including irrigation) and small commercial. MGS has only three members over 1000kVA. MGS provides power to the Standing Rock Indian Reservation which makes up the entirety of Sioux County in MGS's service area and is considered a Disadvantaged Community. Grant County and a portion of Morton County are also considered partially Disadvantaged according to the Justice40 Screening Tool. The outputs can be found in the Appendix.

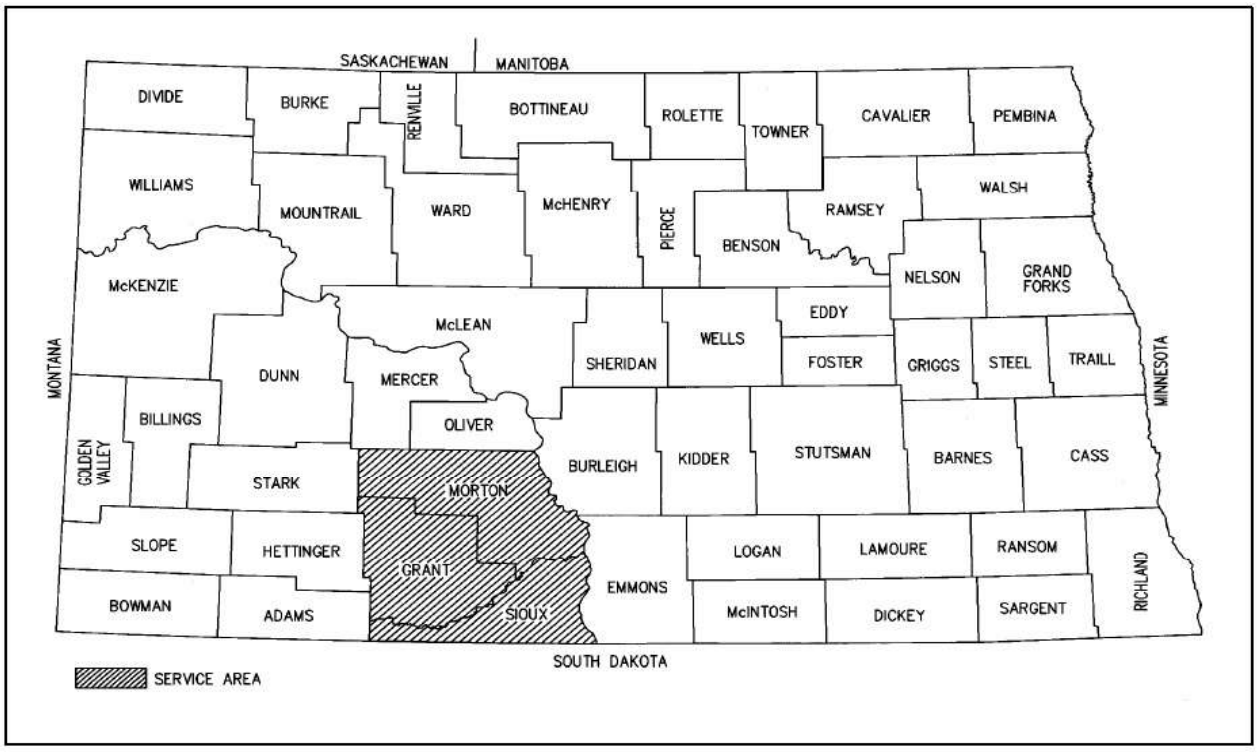


Figure 1: Mor-Gran-Sou Electric Cooperative Service Area

Project Description

MGS plans to upgrade outdated sectionalizing devices with more reliable devices which have newer technology and are compatible with SCADA. Exhibits of the project locations are in Appendix A. MGS plans to replace 10 old hydraulic reclosers with new Cooper Nova T/S with Form 7 Controllers in 3 distribution substations. The new reclosers will be SCADA capable and will allow MGS to remotely operate the devices, reducing outage times and allowing little to no outage time during planned maintenance. MGS has several Cooper Nova T/S devices installed on their system already and have the training necessary to continue to utilize these devices on their system. Proposed locations for the Cooper Nova T/S are shown in Table 1 below.

Table 1: Cooper Nova T/S with Form 7 Controllers

Substation	# Nova T/S w/Controllers	# Meters Impacted	T/R/S	County	State	DAC
Cedar	4	229	T131N R89W S17	Grant	North Dakota	Partially
Elgin	4	345	T134N R89W S15	Grant	North Dakota	Partially
Cannon	2	229	T133N R85W S17	Grant	North Dakota	Partially

In addition to new substation reclosers, MGS plans to replace old single-phase oil filled hydraulic reclosers on distribution lines with 38 newer technology S&C TripSavers as part of this project. These allow the Cooperative to retire oil filled reclosers, reduce their annual maintenance costs, reduce mis-operations, better coordinate between devices, reduce outage hours and frequency, and provide data such as fault current and load current to allow for informed decision making. MGS has been installing S&C TripSavers on their system for the last five years with a good track record of reduced outages, reliable operations, and exceptional customer support. Proposed locations of S&C TripSavers are shown in Table 2 below.

Table 2: S&C TripSaver Locations

Substation-Circuit #	# TripSavers	# Meters Impacted	T/R/S	County	State	DAC
Cedar - Ckt #1	1	134	T129N R90W S8	Grant	North Dakota	Partially
Cedar - Ckt #1	1	134	T129N R89W S4	Grant	North Dakota	Partially
Cedar - Ckt #1	1	134	T129N R89W S11	Grant	North Dakota	Partially
Cedar - Ckt #1	1	134	T131N R89W s32	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T131N R89W S5	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T131N R89W S6	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T132N R89W S20	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T132N R89W S6	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T132N R89W S4	Grant	North Dakota	Partially
Cedar - Ckt #2	1	62	T132N R89W S34	Grant	North Dakota	Partially
Cedar - Ckt #3	1	29	T130N R90W S3	Grant	North Dakota	Partially

Substation-Circuit #	# TripSavers	# Meters Impacted	T/R/S	County	State	DAC
Cedar - Ckt #4	1	38	T131N R88W S20	Grant	North Dakota	Partially
Cedar - Ckt #4	1	38	T131N R88W S21	Grant	North Dakota	Partially
Cedar - Ckt #4	1	38	T131N R88W S8	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T134N R88W S5	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T134N R88W S9	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T134N R87W S6	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T134N R87W S8	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T135N R87W S5	Grant	North Dakota	Partially
Elgin - Ckt #1	1	66	T135N R88W S21	Grant	North Dakota	Partially
Elgin - Ckt #4	1	46	T135N R89W S35	Grant	North Dakota	Partially
Elgin - Ckt #4	1	46	T134N R89W S3	Grant	North Dakota	Partially
Elgin - Ckt #4	1	46	T135N R89W S14	Grant	North Dakota	Partially
Elgin - Ckt #4	1	46	T135N R89W S21	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T 133N R85W S32	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T 133N R85W S26	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T 132N R85W S9	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T 132N R85W S21	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T 132N R85W S28	Grant	North Dakota	Partially
Cannon - Ckt #2	1	137	T132N R83W S19	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R85W S6	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R86W S16	Grant	North Dakota	Partially
Cannon - Ckt #3	2	92	T133N R85W S8	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R84W S8	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R84W S4	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R84W S12	Grant	North Dakota	Partially
Cannon - Ckt #3	1	92	T133N R83W S5	Grant	North Dakota	Partially

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 improving coordination between sectionalizing devices therefore reducing the miles of line and number of meters that are out of power during storm and non-storm events. The mechanisms in the older devices start to wear out over time and no longer operate as precisely as they once did, therefore causing multiple devices to sometimes operate during a fault or causing some devices to not operate at all. If a device that should have operated does not operate at all, it causes the upstream device to operate leaving more meters out of power. Mis-operation of devices makes it harder for line workers to find the fault location, causing the outage duration to be longer. Replacing these older devices with new and more modern devices will reduce the number of meters impacted by interruptions and decrease the longevity of the outage. We have found a reduction of 80-90% in MGS's SAIDI numbers on substation areas converted from oil filled hydraulic style reclosers to TripSavers.

The substation NovaT/S with Form 7 Controllers will be SCADA operable, which will reduce outage times. Instead of having to drive to the substation to manually close the reclosers, there are many instances where the reclosers can be closed remotely with SCADA, reducing outages times dramatically. It is estimated this project will decrease the average duration of outages per member (SAIDI) by at least 50%, and more likely by up to 80%.

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 mechanisms in the older devices start to wear out over time and no longer operate as precisely as they once did, therefore causing multiple devices to sometimes operate during a fault or causing some devices to not operate at all. If a device that should have operated does not operate at all, it causes the upstream device to operate leaving more meters out of power. When this happens, meters are out of power that would have never been out of power had the devices all worked as they should have. In addition, the upgraded Nova T/S and TripSavers collect and record fault 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. We have found a 20-30% reduction in outage frequency on substation areas that have already been converted from oil filled hydraulic reclosers to TripSavers.

The substation Nova T/S with Form 7 Controllers will be SCADA operable. This will help to reduce the frequency of outages as operators can remotely control the devices for preplanned

switching scenarios instead of line crews driving to each substation to perform switching. It is estimated that this project will reduce the frequency of outages by at least 15%.

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

Replacing older oil filled hydraulic sectionalizing devices with Cooper Nova T/S and S&C TripSavers will allow for better coordination between devices, resulting in fewer outages, 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. This project will positively impact 95 non-residential meters with improved service reliability and increased up-time allowing for increased business opportunities in Partially Disadvantaged Communities across MGS's service area.

MGS's last work plan budgeted for the beginning of a SCADA program and continued TripSaver installations. This grant will allow more members to be positively impacted at a faster rate without raising MGS's rates to do so. In addition to remote operation and improved coordination between devices, the loading information provided by the devices will allow MGS to monitor loading and operate the system more efficiently to allow for increased loading due to EVs as well as possible two-way power flow due to increases in solar generation and other distributed generation.

This project is expected to positively impact 803 meters in Grant County, which is classified as a Partially Disadvantaged County by the Justice40 Initiative. Grant County has socioeconomic factors such as high population loss , a high energy to household income ratio, and poor health factors.

All of the improvements will take place either within existing substation yards or at existing pole locations. No new ground will be disturbed. Existing oil tank filled reclosers will be recycled. This eliminates the possibility of ground contamination from any possible oil leaks from the old oil filled tanks. Due to no new ground being disturbed, work being done on existing poles and within existing substations, CFR1970.53 (d)(10) applies, and no environmental report should be needed.

It is estimated that MGS will utilize 2-3 contract individuals (temporary) to install the Cooper Nova T/Ss, 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

MGS plans to order all devices after grant approval and will replace the substation devices with the 10 Cooper Novas within 12 months of receiving the devices. The Cooperative will replace old line reclosers with TripSavers 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 $728,000. That total is made up of $500,000 to replace substation devices with 10 Cooper Novas and Form 7 Controllers, $228,000 to replace distribution line devices with 38 S&C TripSavers. 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.

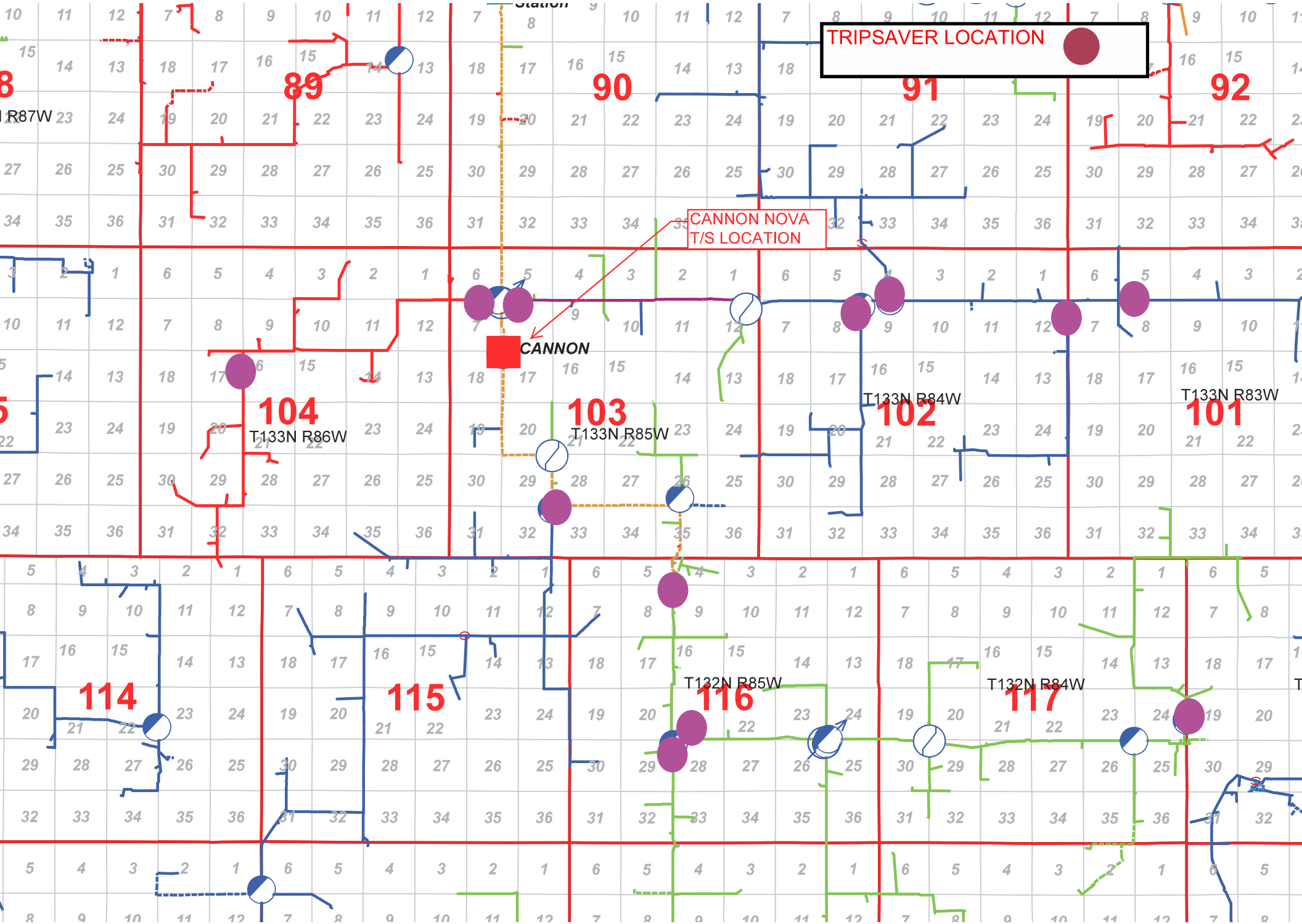
Build American/Buy American

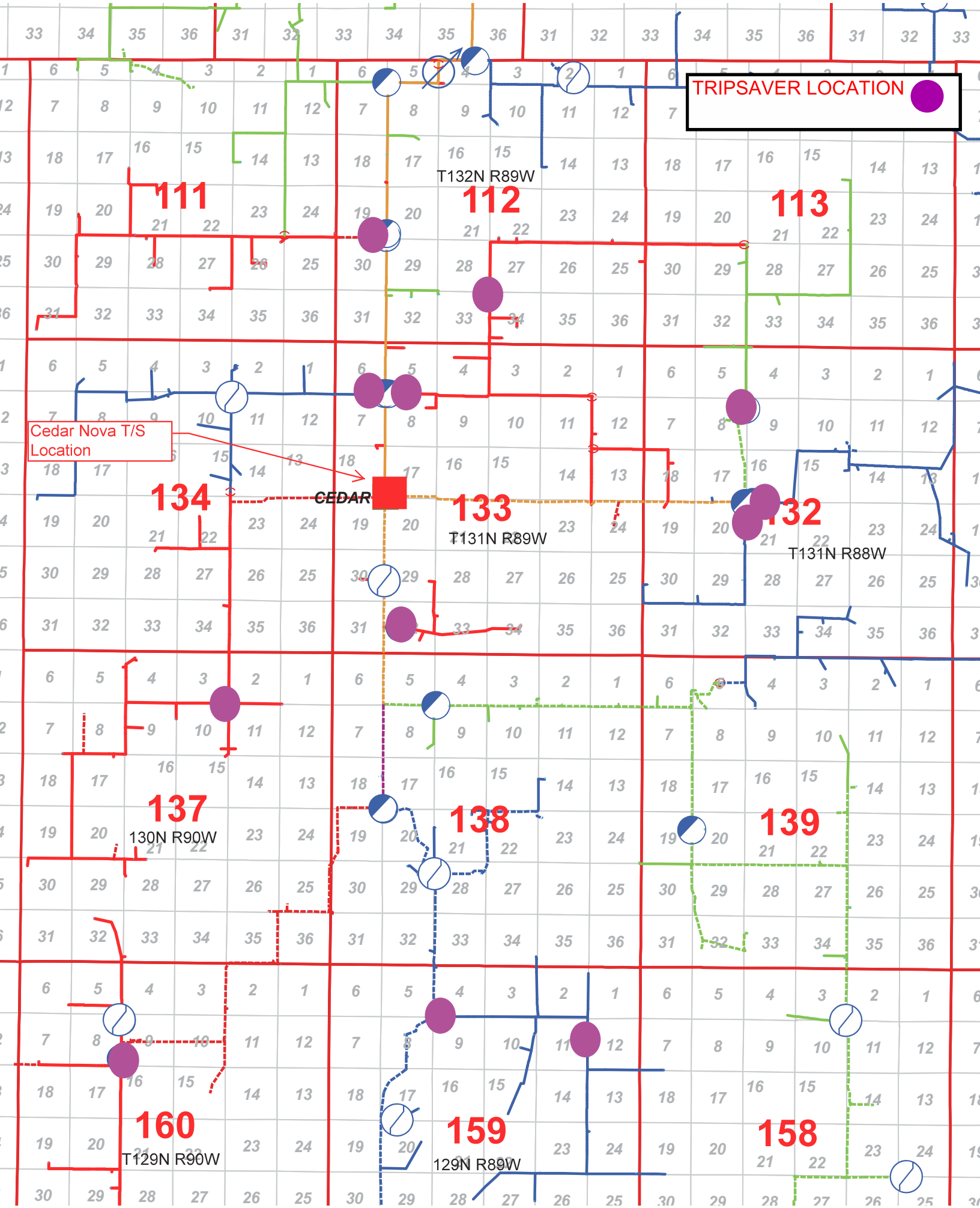
MGS Electric Cooperative is a current RUS borrower and thus follows Build American/Buy American. However, if for whatever reason the manufacturers of the three products are not certified in Buy American, MGS will follow the proper path to apply for waivers or choose a certified Build American/Buy American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

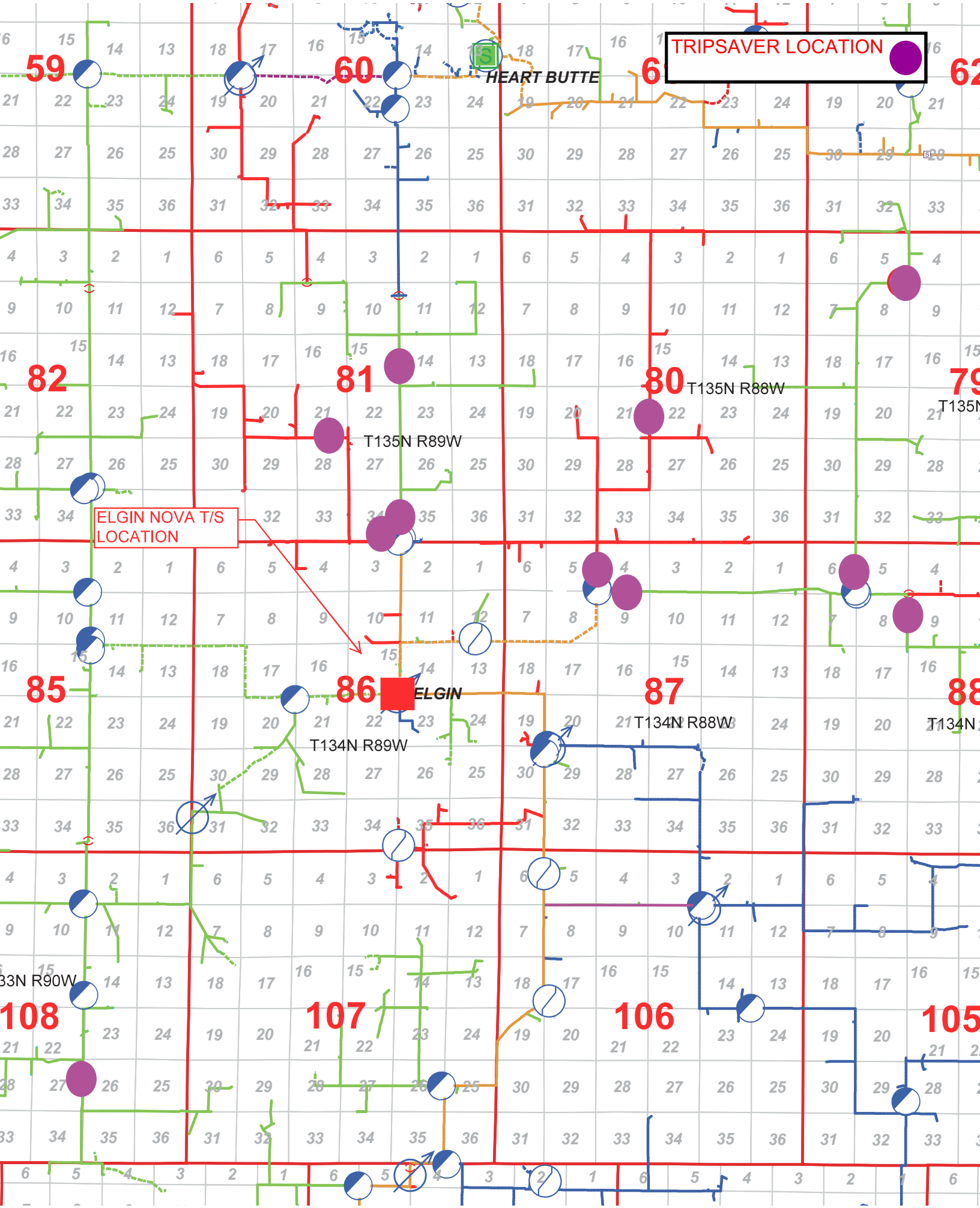
Davis Bacon Act

MGS'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


TRIPSAVER LOCATION
CANNON NOVA T/S LOCATION
CANNON
89
90
91
92
104
T133N R86W
103
T133N R85W
102
T133N R84W
101
T133N R83W
114
115
116
T132N R85W
117
T132N R84W

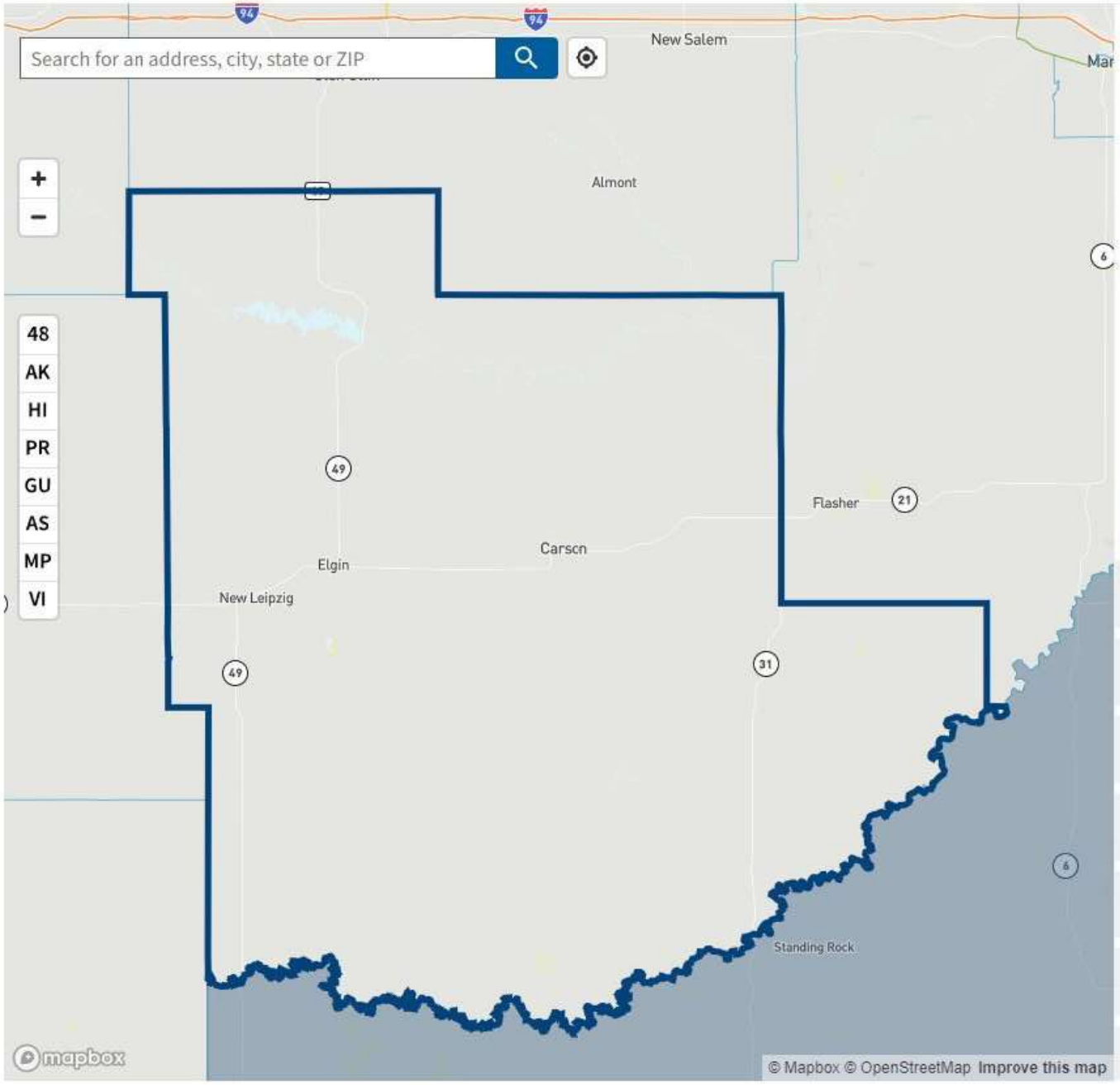

TRIPSAVER LOCATION
Cedar Nova T/S Location
CEDAR
111
112
113
134
133
T131N R89W
132
T131N R88W
137
130N R90W
138
139
160
T129N R90W
159
129N R89W
158
T132N R89W


TRIPSAVER LOCATION
HEART BUTTE
59
60
61
62
82
81
80
79
T135N R89W
T135N R88W
T135N
ELGIN NOVA T/S LOCATION
85
86
ELGIN
87
88
T134N R89W
T134N R88W
T134N
33N R90W
108
107
106
105

Appendix B – DAC Exhibit Exports

Zooming in and selecting shows information about each census tract.

and shapefile from the downloads page.



Tract information
Number: 38037965900
County: Grant County
State: North Dakota
Population: 2,353

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 +
Energy +
Health +
Housing +
Legacy pollution +
Transportation +
Water and +

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.

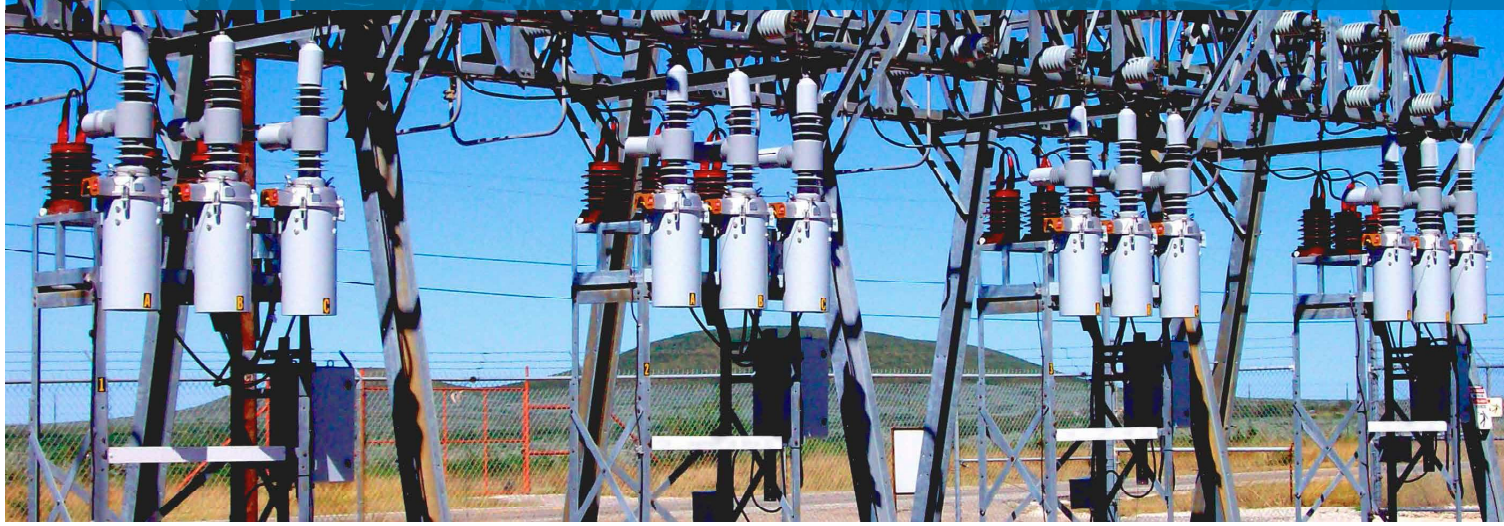
System Engineer (2006-2009)

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 Nova T/S; S&C TripSaver

NOVA-TS
Triple-Single Recloser System

COOPER POWER SERIES



Coordinated, dependable and precise automation

Standardize on the triple-single recloser that provides real benefits and real value. Eaton's Cooper Power series NOVA™-TS triple-single recloser system allows multi-mode configuration for coordinated, dependable and precise automation.

Application versatility, automatic overcurrent protection

The NOVA-TS triple-single recloser system is comprised of the following:

- Three single-phase NOVA-TS reclosers, each with:
  - Manual trip lever
  - Mechanical contact position indicator
- Form 6-TS recloser control
- One compatible, common junction box, which includes:
  - Three interconnecting cables (user-specified length)
  - One receptacle to provide easy access to the Form 6-TS control cable
- Control cable (user-specified length)

The NOVA-TS recloser has three modes of operation:

- **Three-phase trip, three-phase lockout (MODE A)** All three phases simultaneously trip on an overcurrent, reclose and sequence together.
- **Single-phase trip, three-phase lockout (MODE B)** Each individual phase will sense line current and only the phase corresponding to the faulted phase will trip. If any one phase sequences to lockout, the other two phases also lock out, eliminating permanent single-phasing of three-phase loads.
- **Single-phase trip, single-phase lockout (MODE C)** Each individual phase trips and sequences to lockout independently of each other. This is primarily for residential loads and/or where single-phasing of three-phase loads is protected by other means.

EATON
Powering Business Worldwide

Form 6-TS control operation

One Form 6-TS control for three reclosers, easily configured using ProView™ interface software provides:

- Flexible coordination
- Advanced event recorder/data profiler analysis tools
- Voltage, current and harmonic metering

Additionally, the front panel allows the user to manually open and close any phase independently without menu navigation.

Proven reliability

- Automation to improve substation performance
- Light-weight design well-suited for retrofit or new applications

Enhanced protection with dynamic phase tripping

A configurable option for MODE C operation is available to trip and lockout all three phases in the event of a phase-to-phase or three-phase fault. Normal operations occur per the programmed sequence for a single phase-to-ground fault; however, if a phase-to-phase fault occurs, the control will trip and lock out all three reclosers when any one phase sequences to lockout. This avoids any multiphase energization from one phase.

Internal voltage sensing

Using a high-voltage resistor within each interrupter module with source-side connections, the sensing option and control support a magnitude accuracy of 2% or better and a phase degree accuracy of ±1.5°.

Modernize substation applications

- Cost-effective solution for your protection, metering and communication applications
- Automation features of the Form 6-TS control will improve your substation performance
- Add the remote operation, status and analog metering functions to your automation system through standard industry protocols for real-time system analysis and optimization
- Light weight of recloser system may allow for retrofit of existing structure without the expense of foundations or other structural changes

Effective NOVA-TS recloser application

Multiple fault scenarios were analyzed to provide proper system coordination for both phase and ground faults.

- Phase-to-ground, phase-to-phase and three-phase faults, along with multiple faults on different phases, were studied to verify the correct sequencing of each recloser with proper time-current curves
  - Load-side fuse protection is maintained even if two faults occur on different phases prior to resetting the control
- Should problems occur, utility operators would discover great benefits in repairs made on an individual phase basis
- Replacement of individual phase devices brings lower inventory economics and shorter system restoration and bypass intervals

For Eaton's Cooper Power series Switchgear Support Group, call 1-800-497-5953 or visit:
Eaton.com/cooperpowerseries

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United States
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Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
Eaton.com/cooperpowerseries

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August 2019

Powering Business Worldwide

A New Way to Think About **Lateral**

Protection

80% of overhead faults are temporary.

Until now, there were only two strategies for protecting lateral lines from faults: fuse blowing, fuse saving, or a mix of two approaches. These strategies hurt your reliability and cost you money.

Fuse Blowing

Any fault—permanent or temporary—causes the lateral fuse to operate, resulting in a costly truck roll to locate the blown fuse, inspect miles of line, and finally replace the fuse.

Fuse Saving

Before the fuse blows, upstream equipment "blinks" the line to determine whether the fault is temporary or permanent. Blinking results in more momentary outages for everyone connected to the main feeder.

	Truck roll required for temporary fault	Truck roll required for permanent fault	Causes momentary or sustained outage for temporary fault
Fuse Blowing	✓	✓	✓
Fuse Saving		✓	✓

The **TripSaver® II Cutout-Mounted Recloser** combines the best of fuse-saving and fuse-blowing strategies without any of the drawbacks. When a temporary fault occurs, the TripSaver II recloser **eliminates momentary outages** for customers on the main feeder by only blinking the affected laterals. This lateral-protection strategy **improves a utility's reliability and bottom line.**

4x

The TripSaver II recloser is so effective, it pays for itself in 4 avoided truck rolls.

In rural areas with longer lateral lines, utilities can save **$45,000** a year. That is a **90%** rate of return.

S&C has proven that the TripSaver II recloser can help utility customers save up to **$500,000** per feeder, per year.

Speak with your S&C representative or visit sandc.com/ts2 today.

sandc.com

461-G366
March 14, 2016