North Dakota Transmission Authority

North Dakota Industrial Commission

BIL 40101(d) Application

Project Title: McKenzie Electric Cooperative Capacitor Banks, Communications, SCADA Control

Applicant: McKenzie Electric Cooperative

Date of Application: November 20, 2023

Amount of Grant Request: $4,050,000

Total Amount of Proposed Project: $8,100,000

Duration of Project: 2024-2025

Point of Contact (POC):
Karl Aaker
Director Of Engineering

POC Telephone: 701-444-6741

POC Email: kaaker@mckenzieelectric.com

POC Address:
PO Box 649
3817 23rd Ave. NE
Watford City, ND 58854

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Please use this table to fill in the correct corresponding page number.

Applicant Description

Provide a description of the applicant (i.e., type of entity, corporate structure, MWh sold annually, etc.).

Project Description

Provide a description of the project with enough detail to allow the reviewers to adequately evaluate the project.

Standards of Success

Provide a description of how the proposed project will fulfill any or all of the program objectives.

Project Timeline

Provide a project timeline including anticipated start date, significant project milestones, and anticipated project completion date or project duration.

Project Budget

Provide a total project budget, clearly describing the amount of funding requested from NDTA.

Applicant Description

McKenzie Electric Cooperative, Inc. (MEC) is a rural, not for profit electric cooperative governed by a board of nine member-elected directors serving portions of seven counties in northwestern North Dakota and Montana, including service to the North, West, and South Segments of the Fort Berthold Indian Reservation. The Cooperative's first lines were energized in 1947, two short years after the Cooperative's incorporation in 1945. Headquartered in Watford City, N.D., McKenzie Electric provides reliable power to 4,718 members with a total meter count of 13,430, peak demand of 785 MW, and 5,434,578 MWH annually. As a cooperative dedicated to improving the quality of life of its member owners, McKenzie Electric supports the communities in which it operates, by offering safe, reliable, and affordable electricity.

Project Description

McKenzie Electric Cooperative has evaluated the need for additional 115 KV capacitor banks and communication line (Optical Ground Wire or OPGW) upgrades along with commissioning Supervisory Control and Data Acquisition (SCADA) control to our entire substation fleet. With the mission to provide safe, reliable, and affordable electricity to our membership, we recognize the need to respond to critical contingencies with system improvements and modernization technologies. Having recently updated our planning model, we identified the need to install four (4) 115 KV capacitor banks, and upgrade 23.5 miles of communication lines to maintain the stability of our electric grid. Our models indicated delivery point voltages as low as 0.92% of nominal during certain contingencies. With the proposed capacitor banks, we will maintain appropriate transmission voltages. With a growing electrical system, using available technologies to remotely monitor and control equipment offers our members increased reliability and improved response for electrical outages. With reliable communication and SCADA monitoring and control, outages can be responded to immediately, if not avoided all together. Additionally, when working an outage, dispatch personal will be able to support field operations and reduce time spent traveling to and from equipment which can be safely operated remotely. The overall benefit of SCADA control will yield less outages through advanced alarming, reduced outage duration by cutting back on travel time and remote diagnostics and reduce the frequency of outages through optimization of equipment settings and alarms.

Project Summary

- 115 KV Capacitor Banks
    - Proposed Delivery Area
        - Two (2) for Kummer Ridge
        - One (1) for Patent Gate
        - One (1) for Watford City
    - Specifications: 15MVAR, 115 KV, Single Stage.
- OPGW Installation (23.5 Miles)
    - Garden Creek to Banks Transmission Line and OPGW Upgrade
    - Station 8 and Grail Substation OPGW Interconnection
    - Figure 4 to Moccasin Creek OPGW Upgrade
- SCADA Control (55 Substations)
    - Upgrade equipment at Rough Rider Substation for SCADA functionality
    - Upgrade equipment at Mountain Substation for SCADA functionality
    - MEC has 10 additional substations to be completed through other projects

Standards of Success

Capacitor Banks

The installation of four (4) 115 KV capacitor banks will fulfill all three program objectives as detailed below.

- Objective 1 and 2: 115 KV capacitor banks reduce the magnitude, duration, and frequency of grid outages by providing voltage support at the transmission level.
    - All MEC members (4,718 members, 13,430 meters), benefit from improved transmission reliability and resiliency.
    - During and prior to transmission outage events, voltage support allows grid operational flexibility by allowing critical transmission sources to be reconfigured to maintain or restore power. This reconfiguration occurs proactively to avoid outages as well as reactively to restore outages. Restoring an outage via transmission switching generally yield a large number of members restored through each switching operation.
- Objective 3: Capacitor banks modernize the electric grid by eliminating wasted energy measured as power factor, and stabilizing system voltages.
    - MEC strives to maintain our overall system power factor over 95%. By maintaining good power factor more households can be served through transmission system during critical outage contingencies.
    - Wind power is part of our energy supplier's mix, which requires capacitors to compensate for the inherent variability of non-dispatchable

renewable energy. Weather conditions often result in low output which creates a critical contingency in our already generation constrained region. Capacitor banks provide voltage support that allows the transmission system to maintain stable operation.

- Outages can be costly for households in many ways including the cost of generator ownership, maintenance, and operation, as well as the cost of lifestyle and livelihood interruptions to in home businesses, remote workers, schooling, and many other activities. By avoiding or reducing the impact of outages, households experience less financial burden.
- The engineering, construction, commissioning, maintenance, and operation of the proposed capacitor banks will require over 12 workers within numerous trades, and professions in addition to material manufacturing workers.

OPGW Installation

Improving communications with dedicated OPGW on transmission lines will fulfill all three program objectives as detailed below.

- Objective 1 and 2: Through the use of communication infrastructure, MEC reduces the magnitude, duration, and frequency of grid outages with remote monitoring to avoid and detect outages and remote operating of field equipment to promptly restore outages.
  - Installing OPGW from Garden Creek to Banks will provide direct communication to about 80% of our substation fleet. Without this solution, MEC is dependent on leased communication lines which have historically been unreliable with three (3) significant interruptions in the last two (2) years. During such an interruption, MEC loses SCADA connectivity used to efficiently monitor the electric grid and provide vital remote response to grid outages.
  - The installation of OPGW to Station 8 and Grail will provide direct communication to two (2) critical gas processing facilities. These facilities as well as many others benefiting from these projects, are critical facilities that provide vital natural gas used for the heating of homes not only in our region but across the country in addition to providing fuel for power generation.
  - Figure 4 to Moccasin Creek OPGW upgrade will create a communication loop servicing the Fort Berthold Indian Reservation (FBIR). A separate fully funded project is bringing increased power capacity and radial OPGW communications onto the FBIR. This project will convert that radial communication into a high availability looped communication network.

- Objective 3: OPGW is a fiber optic communication technology that allows utilities to modernize transmission lines with cost effective communication lines to aid in the operation of the electric grid.
    - Providing power in rural North Dakota, reliable communications can be a challenge with some remote areas not having accessibility to telecom utilities or wireless communications. MEC desires our OPGW network to overcome rural communication limitations and be as resilient and reliable as our electric system.
    - MEC receives numerous inquiries regarding distributed generation. To support these types of requests, a reliable communication network must be in place to provide monitoring and control of that generation, to ensure high availability.
    - The engineering, construction, commissioning, maintenance, and operation of these communication lines will require over 12 workers in addition to material manufacturing workers.

SCADA Control

SCADA Control deployment will fulfill all three program objects as detailed below.

- Objective 1 and 2: Implementing SCADA control provides a technology to reduce the magnitude, duration, and frequency of grid outages.
    - SCADA control is capable of effective prevention of avoidable grid outages through proactive identification of equipment or grid issues and allows for remote response to those issues. This is done in real time and prevents some grid outages entirely. During weather events, alternative settings may be initiated remotely to help avoid sustained outages or reduce power disruptions.
    - SCADA is an immediate response technology for grid outages. Without needing to roll a truck, a SCADA operator identifies where, what, and sometimes why an outage occurred and then restores the outage remotely or supports field personal with restoration. This yields a significantly shorter outage duration for members. MEC estimates that for applicable outages, the average outage duration may be reduced by 149 minutes per occurrence per meter.
- Objective 3: SCADA Control is a grid modernization project that offers the benefit of lower electric grid operating costs which can be passed on to our members. MECs mission statement is to provide safe, reliable, and affordable electricity. Through this project we will be accomplishing all three of these important missions.
    - As a rural cooperative, we serve a vast region of western North Dakota including several communities on the Fort Berthold Indian Reservation. Having SCADA control over our field equipment will allow us to better

monitor our electric grid in these remote communities as well as respond to outages more promptly.

- Along with the implementation of SCADA control, which we estimate requires over eight (8) workers, we will be training existing linemen and technicians as well as future grid operators. We will take full advantage of the functionality offered by SCADA which necessitates our staff to be well trained in its safe operation.
- We envision there may be opportunities for additional staff such as SCADA operators and dispatchers upon completion of SCADA control, which will offer additional jobs in the communities we serve.

Project Implementation

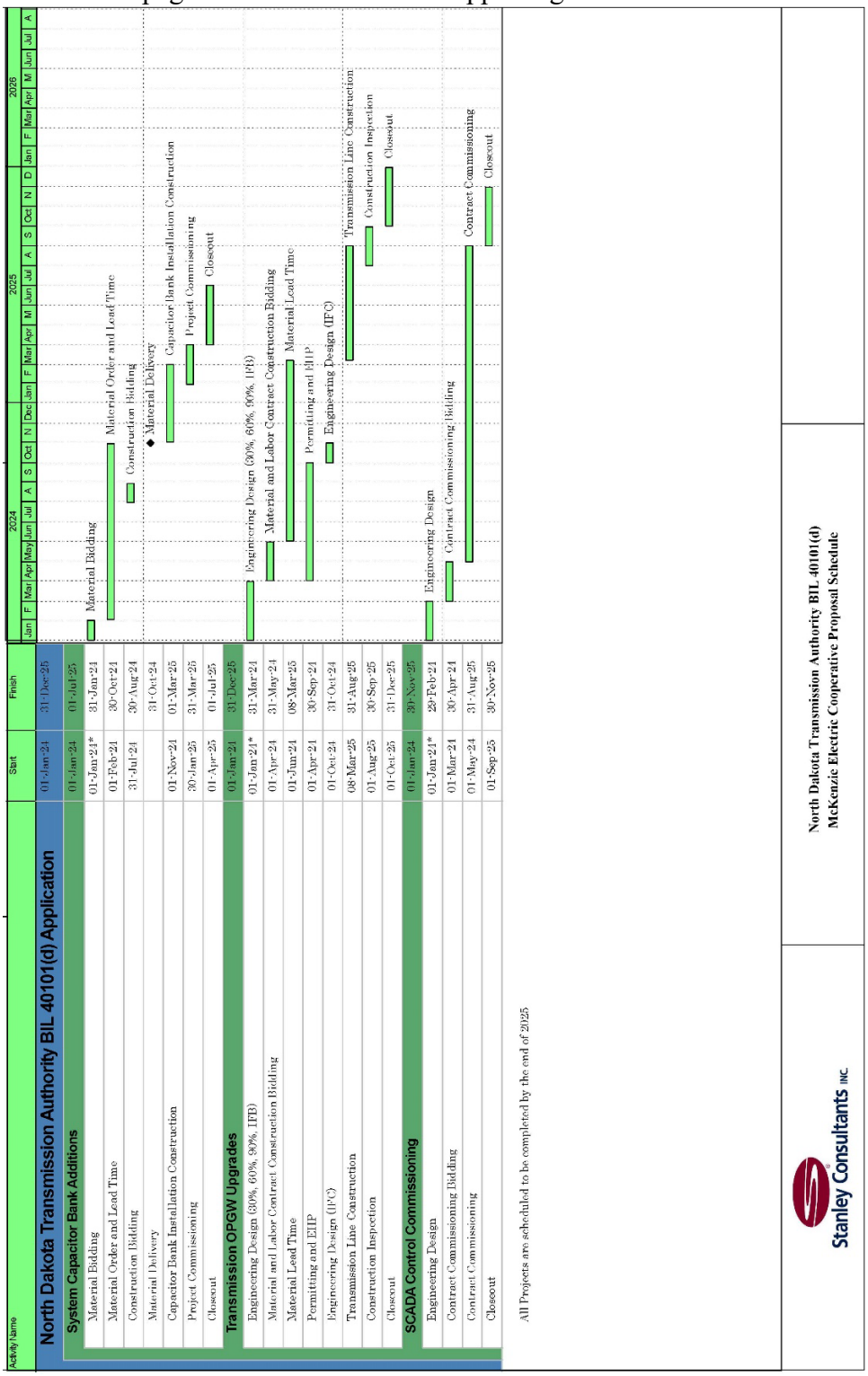
- As a transmission owner and distribution provider, MEC is very familiar with the design, construction, and operation of all proposed projects. With twenty (20) medium voltage capacitor banks and eight (8) 115 KV capacitor banks already deployed on our system, MEC takes pride in maintaining a transmission system with good power factor and stable voltage. With the additional capacitor banks, MEC will further address these key attributes despite power delivery challenges outside of our control.
- As our electric system expands, it is paramount that MEC also expand and improve our communication network. We accomplish this by including OPGW in all standard transmission line designs and seek opportunities to improve the reliability and resiliency of our communication through important network loops and upgrades.
- MEC substations are SCADA ready, however existing functionality is limited to monitoring only. With the proposed project, we will implement SCADA control to all substations. MEC is currently performing a pilot project for 3 substations to commission SCADA control which readies MEC for continued deployments in 2024 and 2025. Additionally, MEC is pursuing a separate grant to deploy SCADA to distribution line equipment such as reclosers, regulators, capacitors, etc. If awarded, it would integrate positively with all other proposed projects.

Project Compliance

- McKenzie Electric is committed to comply with all project requirements including Build America/Buy America (BABA) provision for all required materials and construction, National Environmental Policy Act (NEPA) for all required permitting, although our project as presented does not create any new disturbance on lands, nor any new emissions or discharges, and Davis-Bacon Act (DBA) through competitive bidding processes and rate reviews.

Project Timeline

Full page timeline included in supporting documentation



Project Budget

Project Categories	2024	2025	Total
Capacitor Banks (3)	$ 3,000,000	$ 1,000,000	$ 4,000,000
Garden Creek to Banks **Kummer Ridge to Station 8/Grail** **Figure 4 to Moccasin OPGW**	$ 1,050,000	$ 1,050,000	$ 2,100,000
SCADA Control (55 Subs)	$ 1,000,000	$ 1,000,000	$ 2,000,000
Total Project Cost	**$5,050,000**	**$3,050,000**	**$8,100,000**
McKenzie Cost Share (50%)			**$4,050,000**

McKenzie Electric Cooperative is committed and prepared to provide 50% cost share for the total project cost. Some of these required funds are already allocated in anticipation for grant approval in our 2024 budget. Any additional funds needed will be formally added to our 2024 and 2025 budgets, respectively.

Cost opinions are prepared and provided along with application for reference. For SCADA control, each substation is estimated at $20,000/each based on current pilot project progress.

Supporting Documentation

Project Timeline

UMPC Letter of Support

BEPC Letter of Support

Stanley Consultants Letter of Support

WAPA Letter of Support

WAPA PV Concerns

Voltage Modeling Results and Recommendations

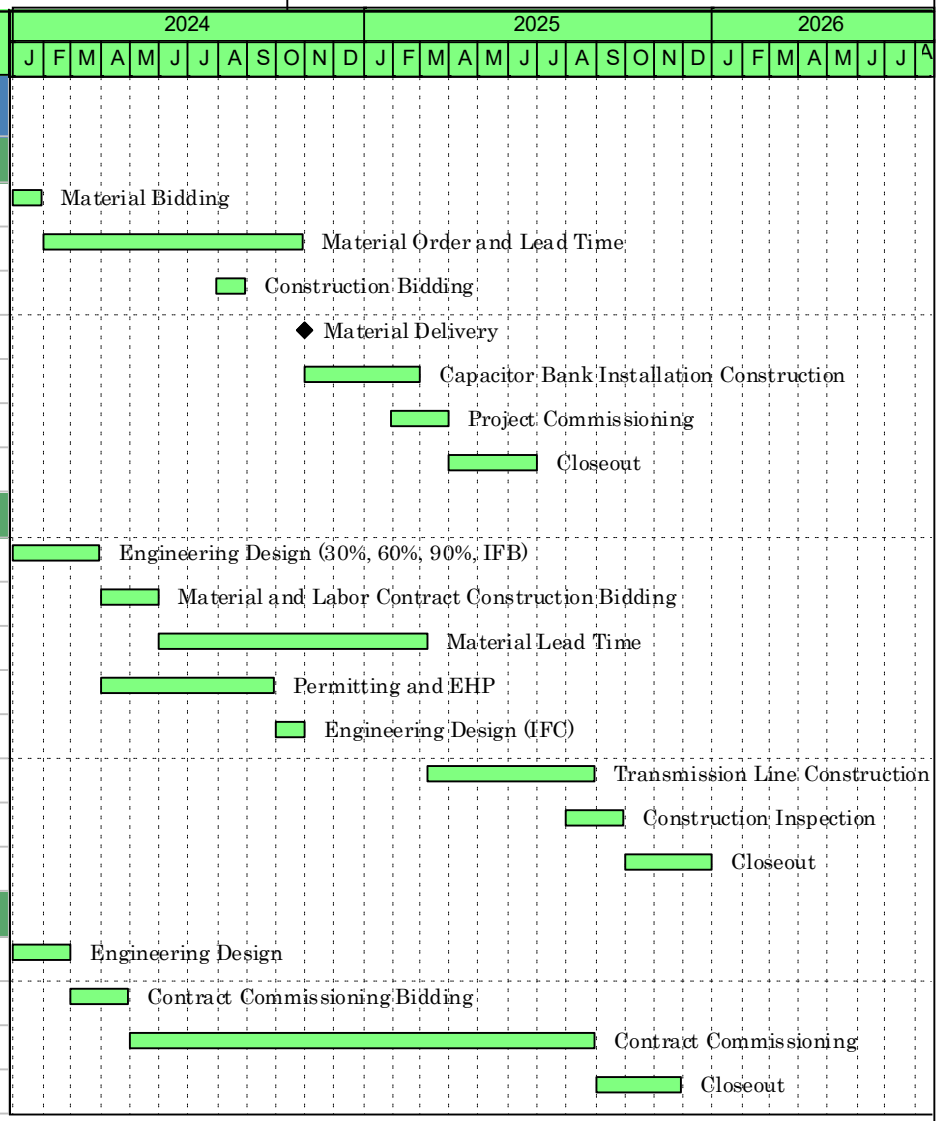
SCADA Reliability Metrics

McKenzie Electric Service Territory (With Substations)

General Arrangement for Capacitors

Estimates

Activity Name	Start	Finish
		-25
System Capacitor Bank Additions	01-Jan-24	01-Jul-25
Material Bidding	01-Jan-24*	31-Jan-24
Material Order and Lead Time	01-Feb-24	30-Oct-24
Construction Bidding	31-Jul-24	30-Aug-24
Material Delivery		31-Oct-24
Capacitor Bank Installation Construction	01-Nov-24	01-Mar-25
Project Commissioning	30-Jan-25	31-Mar-25
Closeout	01-Apr-25	01-Jul-25
Transmission OPGW Upgrades	01-Jan-24	31-Dec-25
Engineering Design (30%, 60%, 90%, IFB)	01-Jan-24*	31-Mar-24
Material and Labor Contract Construction Bidding	01-Apr-24	31-May-24
Material Lead Time	01-Jun-24	08-Mar-25
Permitting and EHP	01-Apr-24	30-Sep-24
Engineering Design (IFC)	01-Oct-24	31-Oct-24
Transmission Line Construction	08-Mar-25	31-Aug-25
Construction Inspection	01-Aug-25	30-Sep-25
Closeout	01-Oct-25	31-Dec-25
SCADA Control Commissioning	01-Jan-24	30-Nov-25
Engineering Design	01-Jan-24*	29-Feb-24
Contract Commissioning Bidding	01-Mar-24	30-Apr-24
Contract Commissioning	01-May-24	31-Aug-25
Closeout	01-Sep-25	30-Nov-25



All projects are scheduled to be completed by the end of 2025

Stanley Consultants INC.

North Dakota Transmission Authority BIL 40101(d) Application
McKenzie Electric Cooperative

Proposal Schedule

UPPER MISSOURI
POWER COOPERATIVE A Touchstone Energy® Cooperative

111 2nd Ave. SW • Sidney, MT 59270 • 406.433.4100

North Dakota Transmission Authority
600 E. Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

November 20th, 2023

Re: McKenzie Electric Cooperative Inc. Capacitor Banks, Communications, and SCADA Control

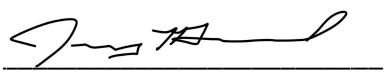
Upper Missouri Power Cooperative (Upper Missouri) is pleased to support McKenzie Electric Cooperative Inc.'s (McKenzie) project, "Capacitor Banks, Communications, and SCADA Control" proposed in the ND Transmission Authority BIL 40101(d) application.

Upper Missouri is a generation and transmission cooperative (i.e., a "G&T") supplying wholesale electricity to its 11 member-owner distribution cooperatives (the Member-Owners or Member Systems), six in eastern Montana and five in western North Dakota. The 11 Member Systems serve more than 76,000 meters – farms, ranches, homes, and businesses – in 37 counties covering a geographic area of almost 55,000 square miles. Upper Missouri's headquarters are located in Sidney, Montana. McKenzie is one of the eleven distribution cooperatives served by Upper Missouri.

Large portions of territory served by Upper Missouri's region have experienced substantial growth over the last two decades, primarily due to oil, gas, and other related services. Due to this growth, Upper Missouri recognizes the need for additional power factor correction (capacitor banks) in McKenzie Electric's service territory. The need for these types of projects has been discussed and encouraged by Western Area Power Administration (WAPA) and Basin Electric, both of which have studied this region in detail. Upper Missouri is also supportive of the communication and SCADA control portions of this project as they will improve McKenzie's ability to operate their system.

Finally, Upper Missouri is encouraged by McKenzie's intent to respond with proposed facilities and technologies to mitigate the effect of regional power supply constraints. Upper Missouri will continue to work with McKenzie Electric and other regional power supply providers to communicate reliability concerns. Upper Missouri does not commit to any financial support for these projects but will support McKenzie through collaboration with power suppliers and providing requested system information as available.

Sincerely,



11-20-2023

Jeremy Mahowald
General Manager
Upper Missouri Power Cooperative

Date

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

11/20/2023

Re: McKenzie Electric Cooperative Inc. Capacitor Banks, Communications, and SCADA Control

Basin Electric Power Cooperative (BEPC) offers this letter of support to McKenzie Electric Cooperative Inc (MEC) in their proposed application to the ND Transmission Authority BIL 40101(d) application. MEC's proposed project, involving Capacitor Banks, Communications, and SCADA Control would be a beneficial project to the region. BEPC has analyzed primary constraints and key transfer paths across this area and has concluded that contingencies in this area may lead to low voltage at MEC delivery points, necessitating mitigative actions.

MEC's project is anticipated to enhance the stability and voltage profile of their transmission system and improve the reliability of MEC's communication network for remote substation control deployment. Considering the consistent growth in electrical demand experienced by BEPC and pending critical power supply enhancements, MEC's project is expected to alleviate potential low voltage events for various contingent events.

We commit to collaborating with MEC on observed power constraints or emergent contingencies identified. This would empower MEC to respond with all available facilities and technologies to mitigate the effect on end user members.

Sincerely yours,

/s/

Jeremy Severson
Vice President Transmission
Basin Electric Power Cooperative

Cc:
Gavin McCollam
Matt Ehrman
Todd Brickhouse

Stanley Consultants INC.

Stanley Building
225 Iowa Avenue
Muscatine, IA 52761

563.264.6600
stanleyconsultants.com

November 20, 2023

Mr. Karl Aaker
Director of Engineering
3817 23rd Ave. NE
Watford City, ND 58854

SUBJECT: North Dakota Transmission Authority BIL 40101(d)

Dear Mr. Aaker:

I am writing in support of McKenzie Electric Cooperative's (McKenzie) North Dakota Transmission Authority BIL 40101(d) Application. Upon reviewing your scope of work and reasoning, I support your application to the North Dakota Transmission Authority for improvements to your system by adding 115kV capacitor banks, improving system communications, and integrating SCADA control into your substation.

Planning by multiple entities has indicated that a low voltage condition is possible at delivery points across the McKenzie System which could result in system-wide outages and impacts. The results from the preliminary transmission study recommend 115kV capacitor banks be installed at four locations throughout the system to support system voltage and maintain normal operation. This low voltage condition can be contributed to an increase in renewable-based generation (specifically wind generation). Additional capacitor banks on the system will allow McKenze to respond to potential electric supply variability as a result of additional renewable generation.

In addition, expansion of the communications and SCADA system, through SCADA Control enhancement and OPGW additions and upgrades, will provide significant benefits to the system, resulting in a reduced quantity and frequency of outages. Remote control and monitoring of equipment will reduce response time significantly by allowing for remote sectionalizing and outage diagnosis prior to crew deployment.

The aforementioned system improvements will assist McKenzie in becoming a more resilient system with fewer outages. Please contact me regarding any questions of my findings or opinions at 563.264.6739 or at kammeric@stanleygroup.com.

Sincerely,

Eric D. Kamm, MBA
Electrical Planner
Stanley Consultants, Inc.

Department of Energy
Western Area Power Administration
Upper Great Plains Customer Service Region
P.O. Box 35800
Billings, MT 59107-5800

B4400.BL

North Dakota Transmission Authority
600 E. Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

Western Area Power Administration – Upper Great Plains Region (WAPA-UGPR) is pleased to express support for the McKenzie Electric Cooperative, Inc. (MEC) proposal to the North Dakota Transmission Authority (NDTA) for implementation of new capacitor banks, communications, and Supervisory Control and Data Acquisition (SCADA) control systems in its service territory, as part of a grid modernization project utilizing Bipartisan Infrastructure Law – Section 40101(d) funding allocated to the State of North Dakota by the U.S. Department of Energy (DOE) Grid Deployment Office (GDO).

WAPA, a Power Marketing Administration (PMA) within DOE, markets wholesale electric hydropower and provides an integral transmission system that delivers power to rural economies, Native American tribes, Federal and state agencies, and others who, in turn, serve more than 40 million Americans. As one of the ten largest transmission organizations in the Nation, owning and operating over 17,000 miles of high-voltage transmission lines, as well as WAPA-UGPR serving as a Transmission Operator in North Dakota, WAPA is keenly aware of the challenges the multi-use transmission system faces from rapid load growth and constrained generation resources. The project proposed by MEC is a proactive step towards improving voltage strength and stability with static reactive support, as well as enhancing system operational flexibility and responsiveness with remote substation controls. WAPA-UGPR regularly assesses operating horizon transmission constraints and, it is clear, the project proposed by MEC will directly improve potential low voltages affecting customers that may result following unplanned losses of key electric power transfer paths serving northwest North Dakota.

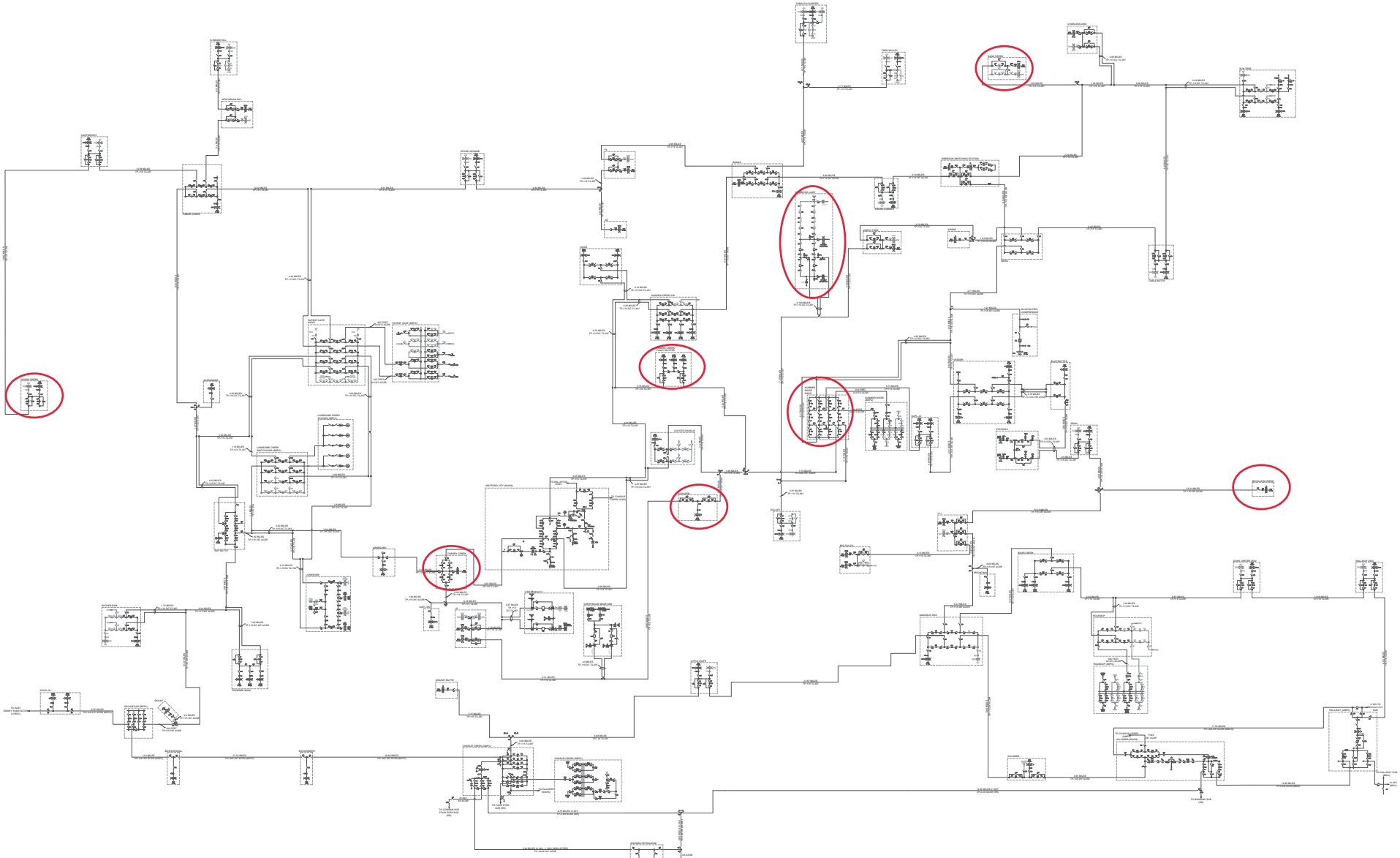
WAPA-UGPR will continue to work with MEC to assess and communicate reliability challenges in the operating horizon and beyond. WAPA-UGPR is committed to supporting MEC efforts with its technical expertise and analytical capabilities to minimize the risk of electric service interruptions, but does not commit to any cost matching requirements as part of its proposal. Through collaboration, WAPA-UGPR may assist MEC to best prepare and respond with its available electrical facilities and technologies to mitigate adverse impacts on end-use customers.

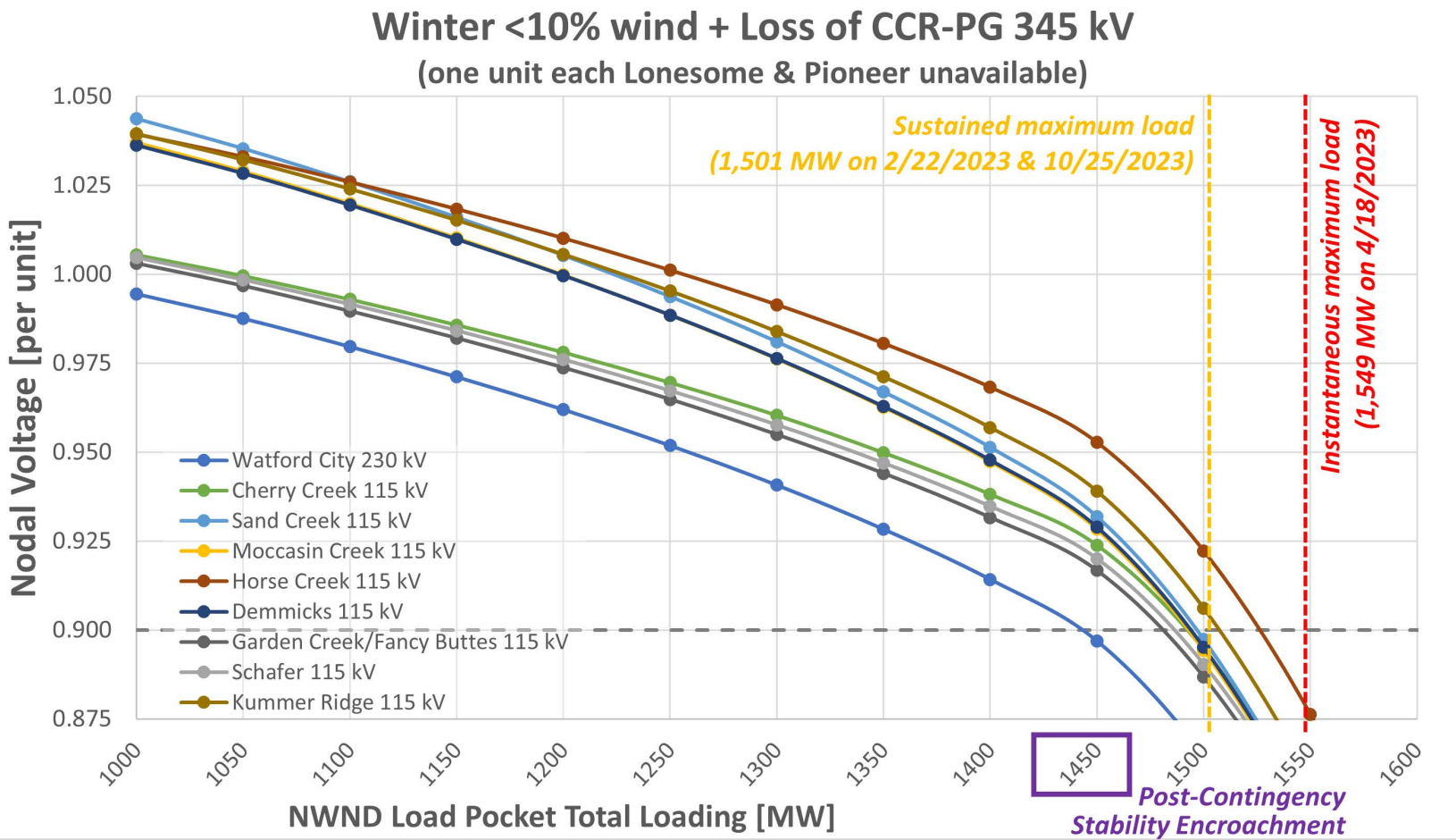
Sincerely,

Christopher M. Colson

Digitally signed by
CHRISTOPHER COLSON
Date: 2023.11.17 10:25:01 -07'00'

Transmission System Planning Manager
Western Area Power Administration-
Upper Great Plains Region




Winter <10% wind + Loss of CCR-PG 345 kV
(one unit each Lonesome & Pioneer unavailable)
Sustained maximum load
(1,501 MW on 2/22/2023 & 10/25/2023)
Instantaneous maximum load
(1,549 MW on 4/18/2023)
Nodal Voltage [per unit]
1.050
1.025
1.000
0.975
0.950
0.925
0.900
0.875
Watford City 230 kV
Cherry Creek 115 kV
Sand Creek 115 kV
Moccasin Creek 115 kV
Horse Creek 115 kV
Demmicks 115 kV
Garden Creek/Fancy Buttes 115 kV
Schafer 115 kV
Kummer Ridge 115 kV
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500
1550
1600
NWND Load Pocket Total Loading [MW]
Post-Contingency
Stability Encroachment

L/O PATENT GATE - CHARLIE CREEK 345 kV LINE

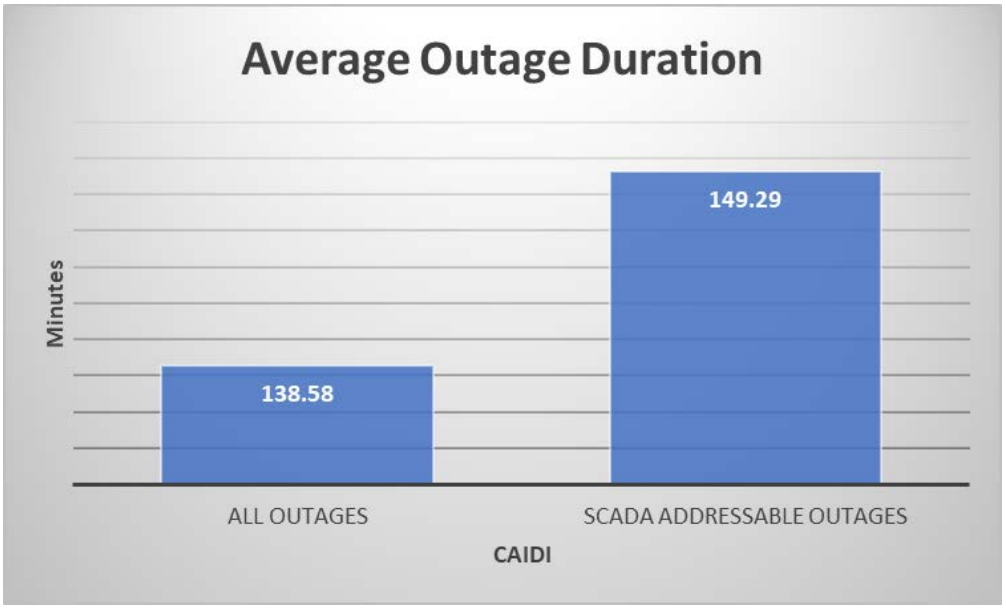
Substation	BEPC			without additional Cap Banks			with additional Cap Banks		
	Vbase	Vcont	Vchange	Vbase	Vcont	Vchange	Vbase	Vcont	Vchange
Kummer Ridge 345	1.0030	0.9625	-0.0405	1.0059	0.9266	-0.0793	1.0273	0.9724	-0.0549
Patent Gate 345	1.0040	0.9649	-0.0391	1.0074	0.9342	-0.0732	1.0213	0.9705	-0.0508
Watford City 230	1.0070	0.9302	-0.0768	1.0063	0.9458	-0.0605	1.0131	0.9576	-0.0555
Round Up 345	1.0070	0.9950	-0.0120	1.0083	1.0034	-0.0049	1.0146	1.0080	-0.0066
Round Up:									
Moccasin	0.9590	0.9462	-0.0128	0.9275	0.9213	-0.0062	0.9796	0.9712	-0.0084
Watford City:									
Schafer	1.0160	0.9544	-0.0616	1.0057	0.9215	-0.0842	1.0327	0.9744	-0.0583
Garden-FB	1.0200	0.9574	-0.0626	1.0040	0.9513	-0.0527	1.0100	0.9617	-0.0483
Patent Gate:									
TBGARDEN	0.9820	0.9453	-0.0367	0.9865	0.9135	-0.0730	1.0216	0.9718	-0.0498
Haybutte	0.9990	0.9630	-0.0360	1.0010	0.9323	-0.0687	1.0156	0.9693	-0.0463
Kummer Ridge:									
Demicks Lake	0.9880	0.9453	-0.0427	1.0010	0.9121	-0.0889	1.0391	0.9774	-0.0617
Berg	1.0130	0.9688	-0.0442	1.0025	0.9142	-0.0883	1.0395	0.9781	-0.0614
COYOTCHR	1.0020	0.9599	-0.0421	1.0065	0.9559	-0.0506	1.0122	0.9658	-0.0464
Grail	0.9970	0.9552	-0.0418	1.0046	0.9192	-0.0854	1.0320	0.9729	-0.0591

Vbase: Voltages under normal condition
Vcont: Voltages after the L/O Patent Gate - Charlie Creek 345 kV
Vchange: difference of Vbase and Vcont

Additional Cap banks (15 MVAr)	Notes
Moccasin 115kV	Funded through other project
Demmicks Lake 115kV	
Berg 115kV	
Banks 115kV	
Watford City Area	Recommended to improve voltage further

SCADA Reliability Metrics
McKenzie Electric Cooperative, Inc.

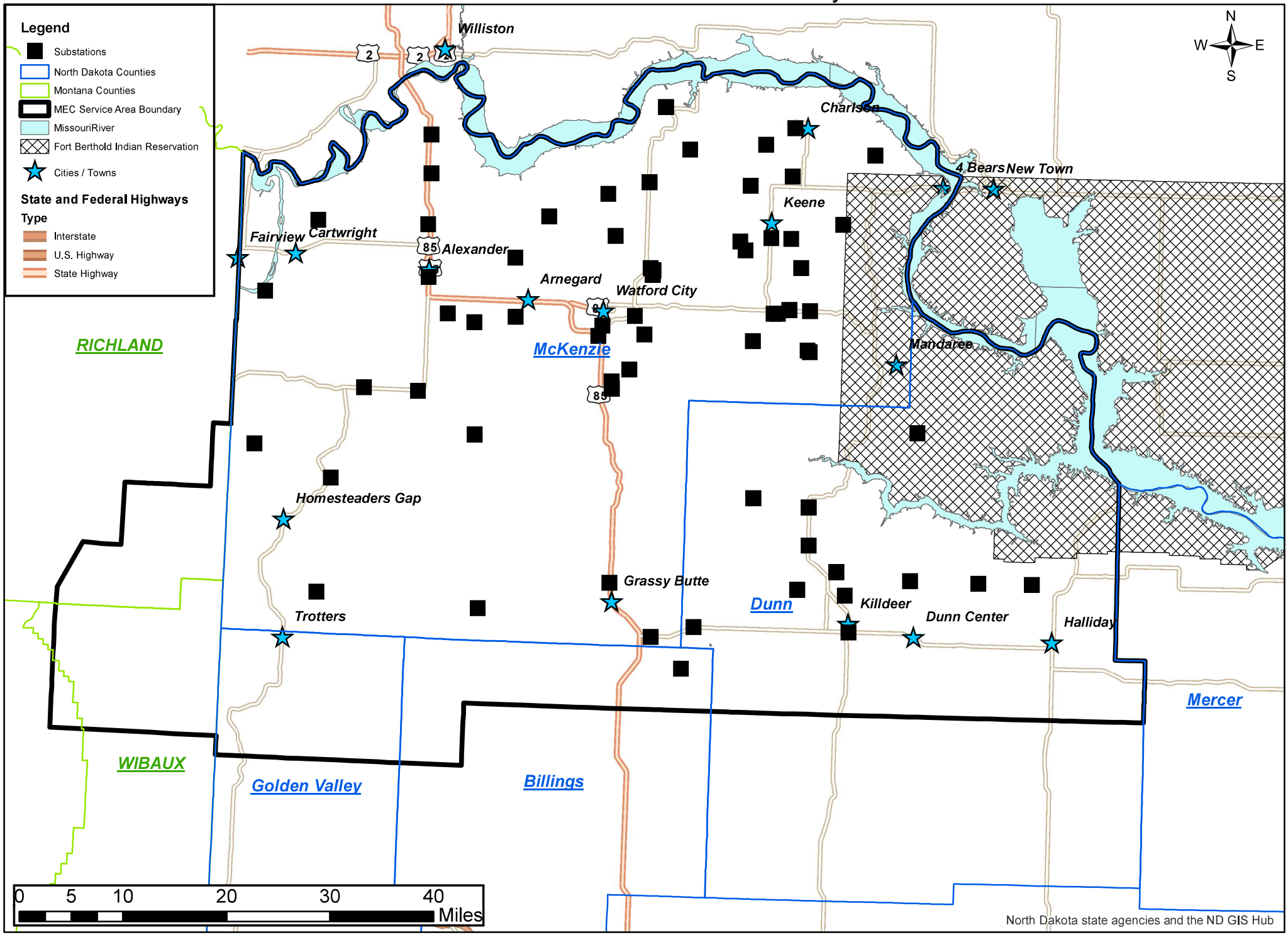
MEC Outage Indices	
CAIDI Category	**Minutes**
All Outages	138.58
SCADA Addressable Outages	149.29

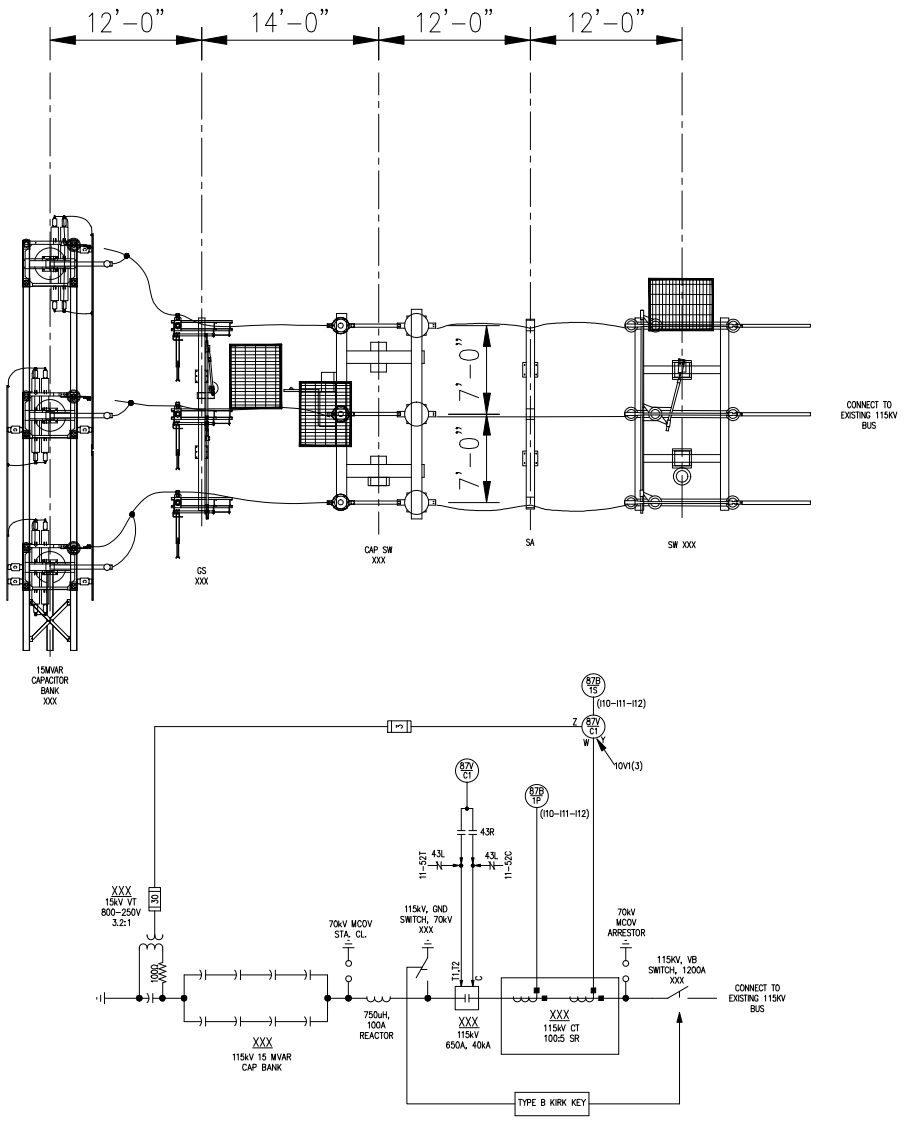


Without having SCADA operation at all of our substations, McKenzie Electric has to dispatch crews to outages that could in the future be restored through SCADA operations. The above numbers reflect our averages from more than 6 years of data. The SCADA addressable outages are events where we could have restored power through SCADA operation.

McKenzie Electric Service Territory

November 2023





CONCEPTUAL

McKenzie Electric COOPERATIVE
Your Touchstone Energy® Cooperative

Stanley Consultants INC.
8000 South Chester Street, Suite 400, Centennial, Colorado 80112-3516
www.stanleyconsultants.com

ISSUE	DATE	DESCRIPTION	ENGINEER	APPROVED BY	PROJECT
0	11/13/23	SCI - CONCEPTUAL 115KV CAP BANK ADDITION			

McKENZIE ELECTRIC COOPERATIVE INC.
WATFORD CITY, ND

CONCEPTUAL
115kV CAP BANK ADDITION

FILENAME	GA-01.dwg
SCALE	NONE

GA-01

McKenzie Electric - 115kV Cap Bank Installation Estimate

Equipment/ Material	Estimated Cost	Lead Time
115kV Cap Bank (15MVAR)	$205,000.00	42-46 weeks
Cap Switcher	$110,000.00	54-56 weeks
Cap Switcher CTs (3)	$50,000.00	32-34 weeks
115kV Disconnect Switch (1200A)	$16,000.00	20-24 weeks
115kV GND Switch	$14,000.00	26-28 weeks
115kV Surge Arresters (3)	$5,400.00	20-22 Weeks
Cap Bank Pannel	$50,000.00	14-16 Weeks
Equip. Sub Total	$450,400.00	
Steel Structures (SA stand, switch stands)	$12,000.00	10-12 weeks
Material Total	$462,400.00	
Construction Estimate	$277,440.00	(60% of equip./mat. estimate)
Engineering Estimate	$73,984.00	(10% of total project costs)
Total Estimated Cost	$813,824.00	
Contigency	$203,456.00	25.00%
Total Estimate	$1,017,280.00	

Garden Creek 2/3 to Banks OPGW Replacement

	Unit(s)		Unit Cost	Cost	Comments
Engineering	1	ea	$ 100,000.00	$ 100,000.00	Lidar is on hand. Engineering will need to layout all structures from Existing P&Ps. Engineering will need to hire a surveyor to acquire pole ground circumference. Engineer to provide structure usage analysis and complete design for OPGW.
Relay Engineering	1	ea	$ 18,000.00	$ 18,000.00	Engineer will need to design new relay settings at Banks and Garden Creek 2/3
Materials					
Poles	10	ea	$ 5,500.00	$ 55,000.00	MEC is assuming that 10 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
OPGW	60000	ft	$ 1.55	$ 93,000.00	Cost of fiber in 2023 was $1.37/ft. The ground line distance from Banks to Garden Creek 2/3 is 52,000'. 15% has been added due to sag and deadends.
OPGW Attachments				$ 37,200.00	Cost Estimated with purchase prices of 2023 projects.
TP-115 Materials	10	ea	$ 4,000.00	$ 40,000.00	MEC is assuming that 10 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
Splice Box	4	ea	$ 3,500.00	$ 14,000.00	Enclosure is $1,100, bullet shield is $2,000, all other parts included as well.
Construction					
String OPGW	10	mile	$ 19,000.00	$ 190,000.00	
Install TP-115	10	ea	$ 7,000.00	$ 70,000.00	MEC is assuming that 10 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
Fiber Splice	4	ea	$ 5,000.00	$ 20,000.00	
Construcion Oversite	1	ea	$ 10,000.00	$ 10,000.00	MEC time included for inspections and coordination
Relay Crew Mobilization	1	ea	$ 4,000.00	$ 4,000.00	Quote from 2022 adjusted for inflation
Relay Settings Commissioned	2	ea	$ 3,500.00	$ 7,000.00	Quote from 2022 adjusted for inflation
Retirement					
Static Retire				$ 65,000.00	Estimated with a contractor in 2022. Adjusted for inflation
Contingency				20%	
Total				$ 867,840.00	

Kummer Ridge to Station 8 OPGW Interconnect					
	Unit(s)		Unit Cost	Cost	Comments
Engineering	1	ea	$ 20,000.00	$ 20,000.00	1 miles of line design and material call outs.
Materials					
OPGW	6100	ft	$ 1.55	$ 9,455.00	Cost of fiber in 2023 was $1.37/ft. 15% has been added due to sag and deadends.
OPGW Attachments				$ 3,782.00	Cost Estimated with purchase prices of 2023 projects.
Splice Box	2	ea	$ 3,500.00	$ 7,000.00	Enclosure is $1,100, bullet shield is $2,000, all other parts included as well.
Construction					
String OPGW	1.1	mile	$ 19,000.00	$ 20,900.00	
Fiber Splice	2	ea	$ 5,000.00	$ 10,000.00	
Retirement					
Static Retire				$ 5,000.00	
Contingency				20%	
Total				$ 91,364.40	

Figure 4 to Moccasin Creek OPGW Replacement

	Unit(s)		Unit Cost	Cost	Comments
Engineering	1	ea	$ 110,000.00	$ 110,000.00	Lidar is on hand. Engineering will need to layout all structures from Exisitng PLS Cadd. Engineering will need to hire a surveyor to acquire pole ground circumference. Engineer to provide structure usage analysis and complete design for OPGW.
Relay Engineering	1	ea	$ 18,000.00	$ 18,000.00	Engineer will need to design new relay settings at Figure 4 and Moccasin Creek
Materials					
Poles	15	ea	$ 6,500.00	$ 97,500.00	MEC is assuming that 15 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
OPGW	71650	ft	$ 1.55	$ 111,057.50	Cost of fiber in 2023 was $1.37/ft. The ground line distance from Figure 4 to Moccasin Creek is 65,148'. 10% has been added due to sag and deadends.
OPGW Attachments				$ 44,423.00	Cost Estimated with purchase prices of 2023 projects.
TP-115 Materials	15	ea	$ 4,000.00	$ 60,000.00	MEC is assuming that 15 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
Splice Box	5	ea	$ 3,500.00	$ 17,500.00	Enclosure is $1,100, bullet shield is $2,000, all other parts included as well.
Construction					
String OPGW	12.5	mile	$ 19,000.00	$ 237,500.00	
Install TP-115	15	ea	$ 7,000.00	$ 105,000.00	MEC is assuming that 15 poles will fail during the structure usage analysis. MEC is estimating to replace these poles
Fiber Splice	5	ea	$ 5,000.00	$ 25,000.00	
Construcion Oversite	1	ea	$ 10,000.00	$ 10,000.00	MEC time included for inspections and coordination
Relay Crew Mobilization	1	ea	$ 4,000.00	$ 4,000.00	Quote from 2022 adjusted for inflation
Relay Settings Commissioned	2	ea	$ 3,500.00	$ 7,000.00	Quote from 2022 adjusted for inflation
Retirement					
Static Retire				$ 70,000.00	Estimated with a contractor in 2022. Adjusted for inflation
Contingency				20%	
Total				$ 1,100,376.60	

Roughrider Sub Estimate
2023
Opinion of Probable Cost

November 16, 2023
Rev0

DESCRIPTION	Option 1	Option 2	Option 3
Equipment	$ 158,600.00	$ -	$ -
Electrical Bus, Power Cable, Fiber/OPGW	$ 27,375.00	$ -	$ -
Steel Structures	$ 9,900.00	$ -	$ -
Foundations	$ 50,000.00	$ -	$ -
Conduit, Cable & Grounding	$ 78,250.00	$ -	$ -
Site Work & Fence	$ 13,200.00	$ -	$ -
Control Building & Relays	$ 69,600.00	$ -	$ -
Field Acceptance and Maintenance Testing	$ 1,000.00	$ -	$ -
Demolition of Existing Facilities	$ 6,000.00	$ -	$ -
Engineering	$ 125,000.00	$ -	
TOTAL OPINION OF COST	$ 538,925.00	$ -	$ -
CONTIGENCY (20%)	$ 646,710.00	$ -	$ -

Notes:

1. Cost opinion are based on standard MEC Cost Opinion Spreadsheet
2. Equipment and structure prices are based on quotes received recently for similar projects.
3. Standard markup has been included on equipment pricing and subcontracted services.
4. Items listed above include material and labor.

Mountain Fiber Install and SCADA Engineering

	Unit(s)		Unit Cost	Cost	Comments
Engineering (2024)	1	ea	$ 70,000.00	$ 70,000.00	Engineering includes the design and routing of fiberoptic cable and SCADA Design. Relay panels design included. Cost of Blue Buttes SCADA engineering was $60k and that did not include panel design, bidding, and wiring updates.
Materials					
Underground Fiber	400	ft	$ 5.00	$ 2,000.00	Estimated cost of underground fiber. This footage is enough to get from the splice box into the control building.
Conduit	400	ft	$ 2.00	$ 800.00	This is for the material that the fiber will be installed in. Estimated as 2" innerduct.
Fiber Materials				$ 200.00	
Splice box in substation	0	ea		$ -	This will be included in a 2025 request for relay panels to accommodate the SCADA material acquisition.
Splice Box	0	ea	$ 3,500.00	$ -	This is included in the cost of the Oakdale to Mountain Transmission line
SCADA misc materials	0	ea	$ 3,000.00	$ -	This will be a 2025 Budget Request
Relay Panels	0	ea	$ 40,000.00	$ -	This will be a 2025 Budget Request. Jacob assumes that 2 relay/communication panels will be needed in 2025. (as of July 2023)
Construction					
Fiber install	400	ft	$ 6.00	$ 2,400.00	
Fiber Splice	0	ea	$ 5,000.00	$ -	Fiber splice included in cost of Oakdale to Mountain Transmission line. Fiber in substation building will not be spliced until the communication panels are installed in 2025.
Construcion Mobilization	1	ea	$ 2,500.00	$ 2,500.00	Estimated cost to mobilize crews and equipment to site
SCADA construction	0	ea	$ 10,000.00	$ -	This will be a 2025 Budget Request.
SCADA T&C	0	ea	$ 20,000.00	$ -	This will be a 2025 Budget Request.
Contingency				20%	
Total				$ 93,480.00	

Mountain SCADA Construction and Commissioning

	Unit(s)		Unit Cost	Cost	Comments
Engineering (2025)	1	ea	$ 10,000.00	$ 10,000.00	Most Engineering efforts are to be completed in 2024. This cost is for assisting in material procurement and answering questions from the contractor.
Materials					
Underground Fiber	0	ft	$ 5.00	$ -	Estimated cost of underground fiber. This footage is enough to get from the splice box into the control building.
Conduit	0	ft	$ 2.00	$ -	This is for the material that the fiber will be installed in. Estimated as 2" innerduct.
Fiber Materials	0	ea	$ 200.00	$ -	
Splice Box	0	ea	$ 3,500.00	$ -	This is included in the cost of the Oakdale to Mountain Transmission line
SCADA misc materials	1	ea	$ 3,000.00	$ 3,000.00	This is for any misc cables and items that need to be installed and procured.
Relay Panels	2	ea	$ 40,000.00	$ 80,000.00	This is assuming 2 panels will need to be installed at the Mounatins substation. TBD.
Construction					
Fiber install	0	ft	$ 6.00	$ -	
Fiber Splice	0	ea	$ 5,000.00	$ -	
Construcion Mobilization	0	ea	$ 2,500.00	$ -	
SCADA construction	1	ea	$ 10,000.00	$ 10,000.00	This will be a 2025 Budget Request.
SCADA T&C	1	ea	$ 20,000.00	$ 20,000.00	This will be a 2025 Budget Request.
Contingency				20%	
Total				$ 147,600.00	