Renewable Energy Council Meeting: Grant Round 53

April 15, 2024, 10:00 am (CT)
Department of Commerce, WSI Boardroom, 1600 E. Century Ave., Suite 1, Bismarck

Click here to join the meeting
+1 701-328-0950,,123419815#

(approximately 10:00 am)

I. Call to Order – *Rich Garman, Chairman's Designee*

II. Administrative Business
   1. **Consideration of November 6, 2023 Meeting Minutes** – *Rich Garman*
   2. Renewable Energy Program Project Management and Financial Report – *Reice Haase*
   3. **Consideration of Project Decommitment:** R-050-064 – **Novel Process for Biocoal Production with CO_2 Mineralization**; Submitted by Envergex, LLC in October 2022; Amount of Award to be Decommitted: $174,830

(approximately 10:30 am)

III. **Consideration of Grant Round 53 Requests** – *Rich Garman*
   1. R-053-A – **Twin Solar Complex;** Submitted by Innovative Renewables, LLC; Total Project Costs: $756,370; Amount Requested: $378,185
      a. Technical Reviewer Results
      b. Technical Advisor Recommendations
      c. Applicant Presentation
   2. R-053-B – **Regional Electric Vehicle Infrastructure Resiliency (REVIR) Plan**; Submitted by Dr. Daisy Selvaraj, EERC-UND; Total Project Costs: $1,875,000; Amount Requested: $375,000
      a. Technical Reviewer Results
      b. Technical Advisor Recommendations
      c. Applicant Presentation

(approximately 11:00 am)

IV. Completion of ballots and **Renewable Energy Council vote on Funding Award Recommendations**

V. Tentative Dates and Venue for next Renewable Energy Council Meeting: September 9-12th, 2024

VI. Other Business

VII. Adjournment

Minutes of the

RENEWABLE ENERGY COUNCIL (REC)

Monday, November 6, 2023

9:00 am (CT)

TEAMS Meeting Via Conference/Video Call

ONSITE Location: Workforce Safety & Insurance Board Room,

1600 E. Century Ave., Ste. 1, Bismarck, ND 58503

Members Present	Staff Present	Guests Present
Josh Teigen, TEAMS	Reice Haase, NDIC	Yun Ji, UND
Gerald Bachmeier	Brenna Jessen, NDIC	Surojit Arm, UND
Al Christianson	Rich Garman, Commerce Dept.	Kevin Connors, EERC
Terry Goerger, TEAMS	Joleen Leier, Commerce Dept.	Brian Kalk, EERC
Tony Grindberg, TEAMS		Eric Murphy, CamBioGene (ND Legislator)
Rodney Holth		Zack Thobe, Marathon Petroleum
		Joey Harris, Bismarck Tribune
		Michael Standaert, TEAMS
		Amanda Parent, TEAMS
		Simon Geoff, TEAMS

WELCOME & OPENING COMMENTS

Josh Teigen called the Renewable Energy Council (REC) meeting to order at 9:00 am. Teigen welcomed the members and guests in the meeting room and on the TEAM video/audio platform.

ADMINISTRATIVE BUSINESS

Approval of Minutes

The minutes from the June 22, 2023, meeting was presented to the board. **It was moved by Bachmeier and seconded by Christianson to approve the June 22, 2023, meeting minutes. The motion carried unanimously.**

Declaration of Conflicts of Interest

Teigen asked if there were any conflicts of interest to declare. Christianson stated he has a conflict of interest with project R-052-A. He consults for company and former employee provided a letter of support for them.

Teigen stated he would entertain a motion to allow those Al Christianson the ability to vote. Holth moved to allow Al Christianson the ability to vote. Bachmeier seconded the motion. Motion passed unanimously.

Renewable Energy Program Project Management and Financial Report

Reice Haase provided an update from the Industrial Commission. Last week they made an employment offer, which was accepted. This will fill an additional grant administrator position. We will also be filling a business office manager position as well.

There were no changes to the Renewable Energy Council's $3M appropriation from the Legislative Special Session held last month. Something the council may be interested in is the program run through the Clean Sustainable Energy Authority. There was a an additional $125 million that was passed by the legislature for a forgivable loan for a new fertilizer facility in North Dakota. The fertilizer facility is required to produce hydrogen by electrolysis and the facility is required to be up and running before the loan is forgiven.

Haase provided an overview of all the funds managed by the Industrial Commission. The Renewable Energy

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Council has $994,658 available today for commitments. REC's financial overview follows:

Description	Funds
Cash Balance	$6,658,140.70
Grants w/Outstanding Payments	$5,180,482.19
One-time Grant Management Software	$250,000
Administration (cost for Industrial Commission to manage program)	$130,000
Legislative Directed-Carbon Capture Education Project	$100,000
Meeting Expenses	$3,000

The Legislature directed that $100,000 will be taken from each Council (REC, Oil & Gas, and Lignite) to be used for the Carbon Capture Education and Outreach program.

REC's funding source is from oil production taxes through the Resources Trust Fund at $3M a biennium. REC has funded 70 cumulative projects. We currently have 18 active projects that represent $6.9M awarded dollars ($1.8M paid to date and $5.1M payable).

Haase also presented the forecasted income for 2023-2025. He stated we are currently slightly above the OMB forecast and anticipate that by the end of this calendar year we will have the $3 million available.

Carbon Capture and Utilization Education and Marketing Special Grant Round Update

Reice Haase gave update on the carbon capture education program. House Bill 1014 directed the Industrial Commission to use $100,000 from the Renewable Energy Council, Lignite Council, and Oil & Gas Council for this education and outreach program. All three councils will need to come together in one grant round to agree on which grants to approve. He anticipates the meeting will be in January 2024.

CONSIDERATION OF SPECIAL GRANT ROUND 52 REQUESTS

Rich Garman gave an overview of project R-052-A. Reviewers' recommendation is to consider funding.

R-052-A – Smart Holistic Zero Waste Utilization Paradigm (SH0WUP)
Principal Investigator: Surojit Gupta
Project Duration: 3 years
Requesting: $500,000
Total Project Cost: $3,780,360 (DOE Funding Requested: $3,000000)

Reviewers' Ratings

- Fund – 192/250
- Fund – 187/250
- Funding May Be Considered – 147/250
- Average Weighted Score – 175.33/250

Surojit Arm presented on the project. Yun Ji was also present to answer questions.

Grindberg asked for details on DOE award and the success of the award. Also provide more explanation on partner and market potential

Competed at the national level for the DOE award which is contingent on REC award. Surojit explained that they are going to use the blades that are retired and then recycle it as there is no room in the landfills. Partnering with other agencies to recycle products and have other companies in mind for Phase II.

Bachmeier clarified financial support overview: $3M from DOE, request for $500,000 from REC, $200,000 from industry itself (5%). Surojit explained that Industry is contributing 20% of their cost share, Tri Steel is contributing 20% and UND 20%.

Rich gave an overview of Project R-052-B. Reviewers' recommendation is to consider funding.

R-052-B – Prairie Horizon Carbon Management Hub
Principal Investigator: Kevin C. Connors
Project Duration: 24 months
Requesting: $100,000
Total Project Costs: $3,225,000

Reviewers' Ratings

- Funding May be Considered – 140/250
- Fund – 230/250
- Fund – 174/250
- Fund – 239/250
- Average Weighted Score – 195.75/250

Kevin Connors presented on the project. Zack Thobe from Marathon Oil spoke about how this project affects their company.

Bachmeier asked if pipelines will be identified. Connors stated that yes, reports will be created. He feels this project will help with the narrative for North Dakotans.

Grindberg asked to please confirm the DOE $2.5 million in federal funds for Prairie Horizon is not part of the recent Heartland Hydrogen Hub financial award. Connors stated DOE funding is not part of the Heartland funding, thus does not create a conflict for Mr. Grindberg.

Rich gave an overview of R-052-C project. Reviewers' recommendation is to consider funding.

R-052-C – Use of Bioengineering to Enhance the Agronomic Potential of Camelina for Use as a Source for Biofuel Feedstock and Meal for Livestock
Principal Investigator: Eric J. Murphy
Project Duration: 3 years
Requesting: $500,000
Total Project Costs: $1,151,250

Reviewers' Ratings

- Funding May be Considered – 161/250

- Fund – 197/250
- Funding May be Considered – 158/250
- Average Weighted Score – 172/250

Eric Murphy presented on the project. He also disclosed that he is a ND Legislator in the House.

Bachmeier asked about the anticipating match of $543,000; how sure are you of receiving that? Murphy stated it is rock solid. Looking for another $250,000 from Commerce for the match.

What is the yield on per acre basis? Murphy responded it is highly variable. It could be between 800-1200 lb per acre. It is variable. It is key to get 2,500 and inputs are low.

DISCUSSION/COMPLETION OF BALLOTS

Ballots were distributed in the room and also emailed to members online. Reice reminded board members if they don't agree with the amount of the request members can make a recommendation.

R-052-A – Smart Holistic Zero Waste Utilization Paradigm (SH0WUP)
Project Duration: 3 years
Requesting: $500,000
Total Project Cost: $3,780,360 (DOE Funding Requested: $3,000000)
Conflict of Interest: None
Fund: 4 Do Not Fund: 1 Abstain: 0

Chairman Teigen entertained motion for project R-052-A. Christianson made a motion to fund at full amount. Bachmeier seconded the motion. Roll call vote all approved.

R-052-B – Prairie Horizon Carbon Management Hub
Project Duration: 24 months
Requesting: $100,000
Total Project Costs: $3,225,000
Conflict of Interest: None
Fund: 5 Do Not Fund: 0 Abstain: 0

Chairman Teigen entertained motion for project R-052-B. Bachmeier moved to fund project R-052-B as requested. Bachmeier seconded the motion. Roll call vote all approved.

R-052-C – Use of Bioengineering to Enhance the Agronomic Potential of Camelina for Use as a Source for Biofuel Feedstock and Meal for Livestock
Project Duration: 3 years
Requesting: $500,000
Total Project Costs: $1,151,250
Conflict of Interest: None
Fund: 2 Do Not Fund: 3 Abstain: 0

Chairman Teigen entertained a motion for project R-052-C. Christianson made a motion to fund project R-052-C at a $250,000 level. No second.

Chairman Teigen entertained an alternate motion for project R-052-C. Bachmeier made a motion not to fund project R-052-C until there is more detail down the line and all allocated funds are in place. Holth seconded the motion. Roll call vote all approved.

ADMINISTRATIVE BUSINESS

Discussion for Proposed Round 53 Deadline – March 1, 2024

Proposed dates for next REC Meeting – April 2024.

Committee member stated they need applications, reviews and applicant responses at least 5-7 days prior to the meeting to allow ample time for review.

OTHER BUSINESS/ADJOURNMENT

Teigen offered an opportunity for public input. With no public comment, the meeting was adjourned at 10:45 am.

RENEWABLE ENERGY PROGRAM PROJECT MANAGEMENT REPORT

Reice Haase, Deputy Executive Director, NDIC

April 15, 2024

renewable ENERGY PROGRAM

NORTH Dakota

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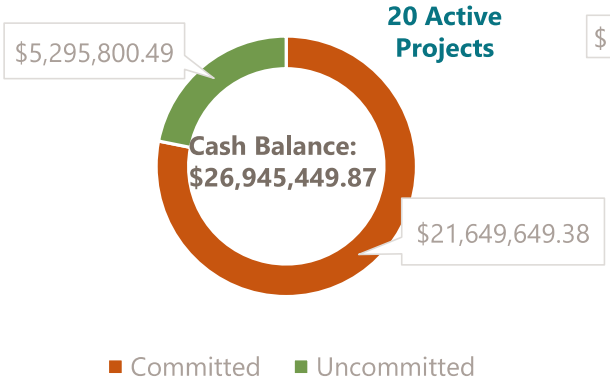
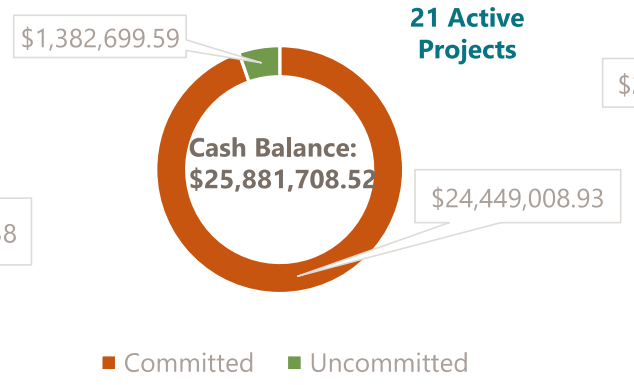
INDUSTRIAL COMMISSION-MANAGED FUNDS

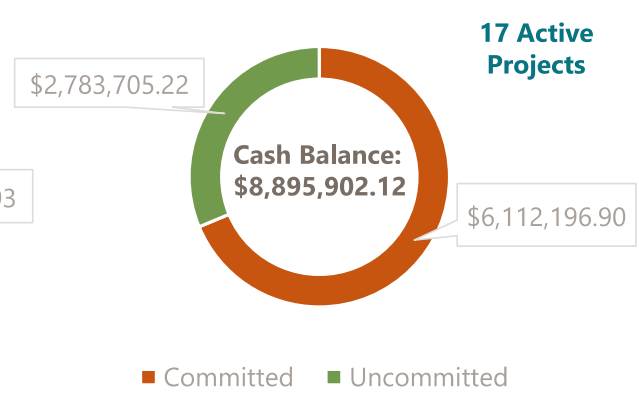
Lignite Research Fund



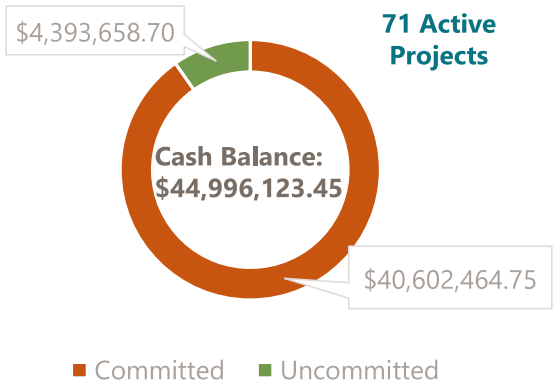
Oil and Gas Research Fund



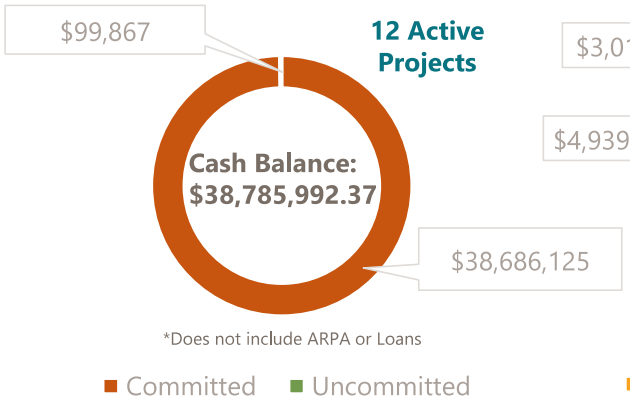
Renewable Energy Fund



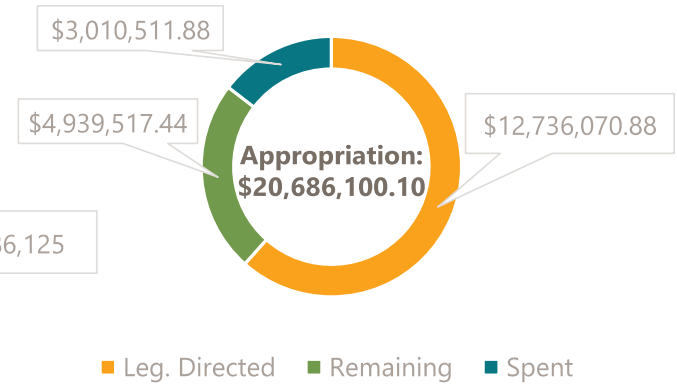
Outdoor Heritage Fund



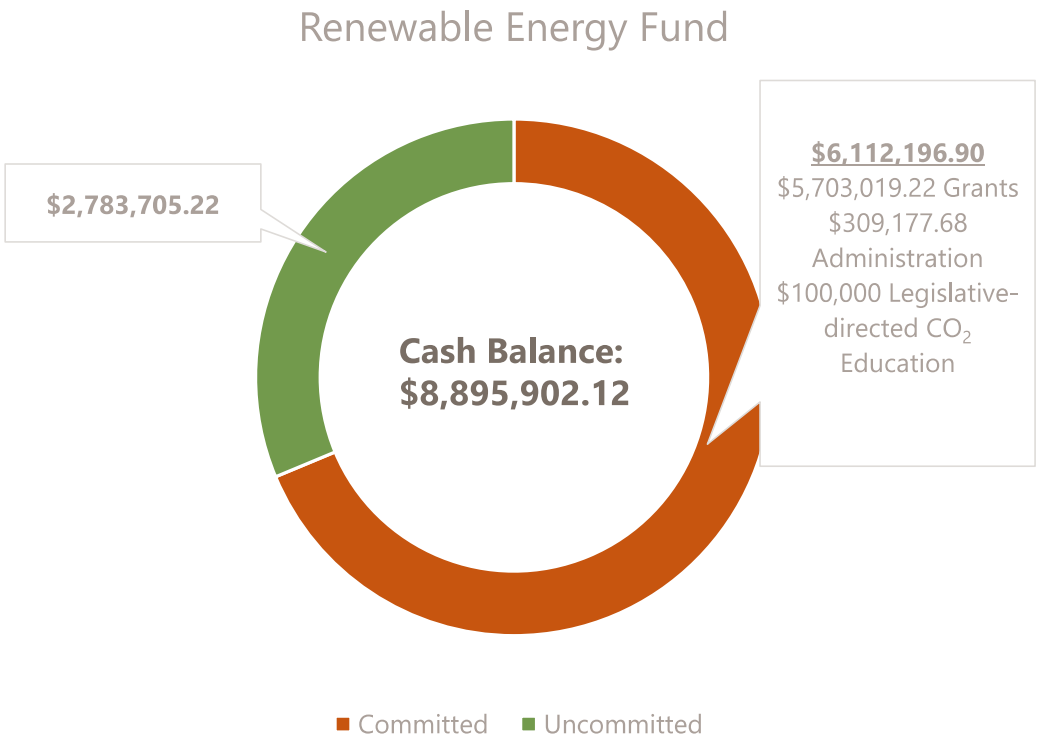
CSEA Fund*



SERC Fund



RENEWABLE ENERGY FUND BALANCE APRIL 15TH, 2024



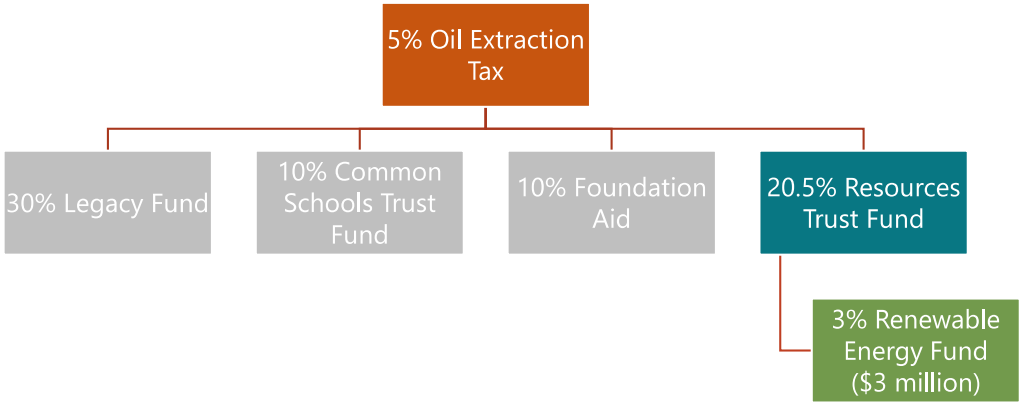
Funding Source:
- **$3 million oil production taxes**

71 Cumulative Projects

17 Active Projects

Cumulative Value:
- **$24 million granted**
- **$161.7 million project value**

2023-2025 BIENNIUM APPROPRIATION AND FORECASTED INCOME



Month	OMB Forecast	Actual
August 2023	$588,234	$523,151.02
September 2023	$607,842	$596,920.57
October 2023	$607,842	$660,900.75
November 2023	$588,234	$770,448.24
December 2023	$607,842	$448,579.42
January 2024	$6	$0 (Filled for biennium)

Assumes:

$62-75/bbl

1.1 m bbls/day

REPORT ON PROJECTS COMPLETED

NORTH Dakota
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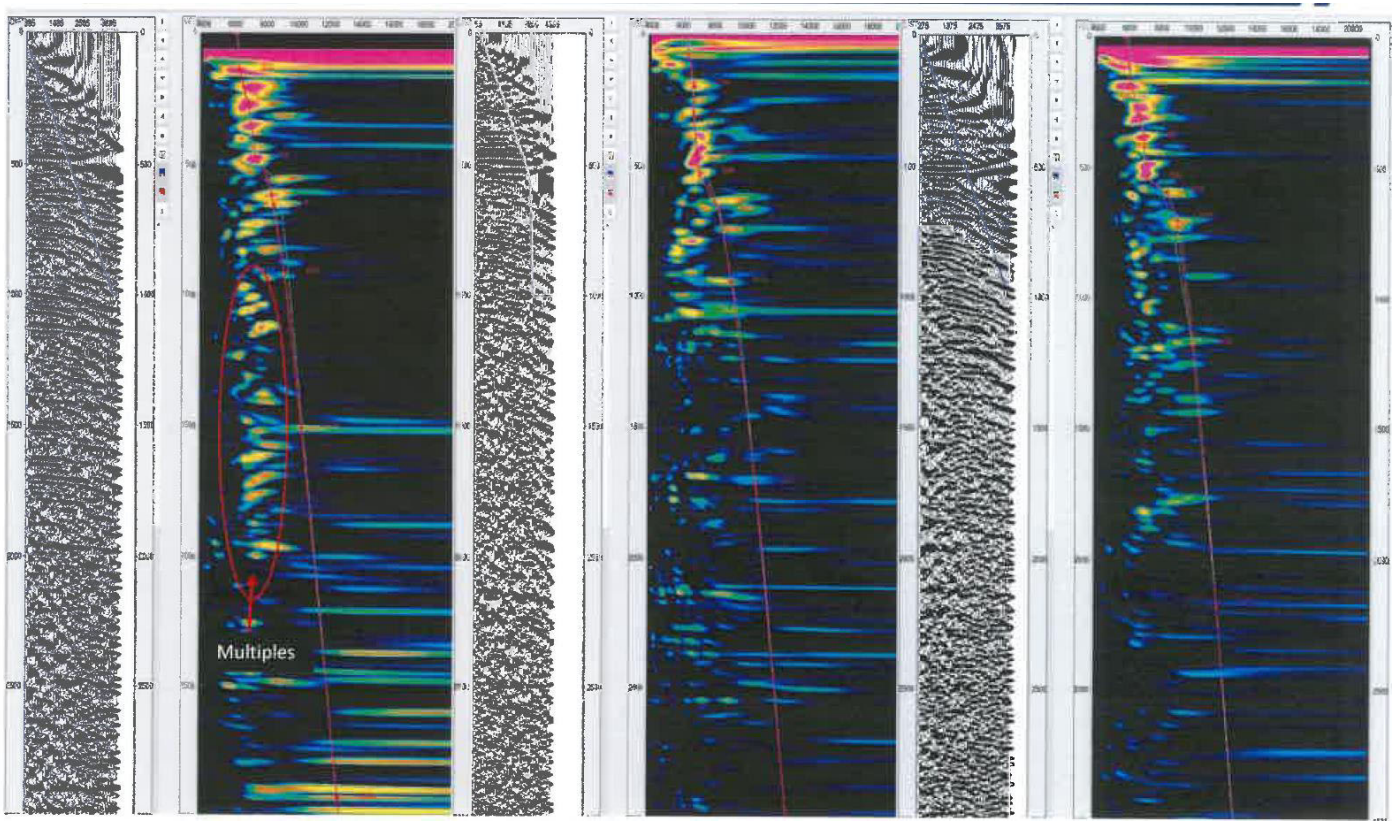
R-027-036: ND Ethanol Council Gateway to Science Ethanol Exhibit

- $500,000 award May 2016
- Gateway to Science closure during move Oct. 2022 – March 2023
- Over 50,000 visitors since grand opening

R-047-058: Midwest Ag Energy CO_2 Storage Assessment in Eastern ND

- $324,640 awarded August 2021
- Seismic surveys of subsurface geology near Spiritwood, ND
- Results suggest better potential for storage further west
- Final Report complete 2024, under budget
- $54,735.57 turnback to Renewable Energy Fund



R-048-060: BWR Renewable Hydrogen Microgrid

- $332,159 awarded November 2021
- Demonstration project for development of hydrogen microgrid generator
- Designed portable, scalable system
- Project complete and closed out March 2024

From: Srivats Srinivasachar <srivats.srinivasachar@envergex.com>
Sent: Wednesday, March 6, 2024 11:27 AM
To: Stieg, Erin E.
Cc: Haase, Reice
Subject: Re: Renewable Energy Grant R-050-064 (Biocoal)

Hi Erin,

Thank you for reaching out regarding the grant for R-050-064 (Novel process for biocoal production with CO_2 mineralization to achieve negative carbon emissions).

We had originally submitted this proposal with cost-share being provided by a USDA project. Due to unforeseen circumstances, the period of performance of the cost-share project did not match, and we do not have the cost-share at this time.

As we are not in a position to move forward with the project, please decommit the $174,830 back to the Renewable Energy Fund.

We appreciate your efforts in considering our proposal and making the award. We look forward to additional opportunities in the future.

Best regards,

Srivats Srinivasachar
Srivats Srinivasachar
Envergex LLC
10 Podunk Road
Sturbridge, MA 01566
Phone: (508) 347-2933
Mobile: (508) 479-3784
E-mail: srivats.srinivasachar@envergex.com

Renewable Energy Development Program										
Grant Round 53 Applications (April 2023)										
Grant #	Application Title	Applicant	Summary	Principal Investigator	Funding Requested	Total Project Costs	Applicant Match	Duration	Funding Info	Technical Review Score
R-053-A	Twin Solar Complex	Innovative Renewables, LLC	Investigation and demonstration of ROI of carbon-negative, stick-built home that incorporates passive building design, solar power, and battery storage	Jay Schulte	$378,185	$756,370	50%	1.5 Years	Cash match provided by applicant	147.33/250
R-053-B	Regional Electric Vehicle Infrastructure Resiliency (REVIR) Plan	EERC	Development of Regional Electric Vehicle Infrastructure Resilience Plan to support actionable, adaptable and evoling road map for electric vehicle infrasturcture	Dr. Daisy Selvaraj	$375,000	$1,875,000	80%	2 Years	Cash match provided by DOE	202/250
	Total being considered				**$753,185**	**$2,631,370**				

Jay Schulte
Innovative Renewables, LLC
701-400-8089
jay@innovativerenewables.com
Bismarck, ND 58501

March 1, 2024

North Dakota Industrial Commission
Attention: Renewable Energy Program
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

To whom it may concern,

Attached is the application for the proposed Twin Solar Complex that aims to investigate the additional investment costs and return on investment of a net-zero home built using passive home building techniques versus a traditionally built house that follows the city of Bismarck's building code.

The proposed investigation will construct two (2) homes with identical floorplans on the same city lot located in Bismarck, ND but built to different building standards. Each home will utilize photovoltaics paired with battery storage systems to generate and store electricity with the goal of each home to be net-zero. Upon completion of the two (2) homes, an energy assessment will be conducted to estimate the overall efficiency of each home. The electrical energy consumption and production of each home will be monitored for one (1) year and analyzed to develop baseline information for a home built using passive home building techniques. The data collected and knowledge developed through this investigation will be shared with the state of North Dakota in both the public and private sectors.

Thank you for considering this investigation to develop baseline information to better understand how a net-zero passively built home will function in the state of North Dakota. If any questions arise while reviewing this application, please feel free to contact me. I look forward to hearing back from the North Dakota Industrial Commission on this project.

Sincerely,

Jay Schulte
Innovative Renewables, LLC

APPLICATION CHECKLIST

Use this checklist as a tool to ensure that you have all of the components of the application package. Please note, this checklist is for your use only and does not need to be included in the package.

☒	Application
☒	Transmittal Letter
☒	$100 Application Fee
☒	Tax Liability Statement
☐	Letters of Support (If Applicable)
☒	Other Appendices (If Applicable)

When the package is completed, send an electronic version to the Industrial Commission at ndicgrants@nd.gov. Send payment to:

North Dakota Industrial Commission
Attention: Renewable Energy Program
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

For more information on the application process please visit:
https://www.ndic.nd.gov/renewable-energy-program/rep-applicant-council-information

Questions can be addressed by calling 701-328-3722.

Renewable Energy Program

North Dakota Industrial Commission

Application

Project Title: TWIN SOLAR COMPLEX

Applicant: INNOVATIVE RENEWABLES, LLC

Principal Investigator: JAY SCHULTE

Date of Application: 2-29-24

Amount of Request: $378,185

Total Amount of Proposed Project: $756,370

Duration of Project: 1.5 YEARS

Point of Contact (POC): JAY SCHULTE

POC Telephone: 701-400-8089

POC Email: JAY@INNOVATIVERENEWABLES.COM

POC Address: 1016 CRESCENT LANE
BISMARCK, ND 58501

TABLE OF CONTENTS

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

ABSTRACT

Objective:

Innovative Renewables, LLC and Plain View Design + Build are working together to investigate the additional investment costs and the return on investment (ROI) of a stick-built home that applies passive home building techniques versus a traditional stick-built house that follows the city of Bismarck's building code. This investigation will construct two (2) homes with identical floorplans on the same city lot located in Bismarck, ND but built to different building standards. Each home will utilize photovoltaics (PV) paired with battery storage systems to generate and store electricity with the goal to be net-zero homes. As part of this investigation, Innovative Renewables, LLC will monitor the electrical energy consumption and production of each home for one (1) year and document the findings. Upon completion of the homes, Plain View Design + Build will conduct an energy assessment, i.e., blower door test, to estimate the overall efficiency of each home. After a year of data collecting, any findings or knowledge developed will be shared with the state of North Dakota and North Dakota's home builder associations. Another goal of this investigation is to develop renewable energy careers in the state of North Dakota through educational channels, both public and private, and a digital marketing campaign of this project.

Expected Results:

The expected results of this investigation are that the home built using passive home building techniques will be more energy efficient than the traditionally built home. Electrical energy consumption is expected to be greater in the traditionally built home but will also be impacted by the end-user and their daily lifestyle. The energy produced at each home is going to vary only by a small margin as each home's PV system is going to be identical. The initial investment to make one home more efficient is going to take several years to see an ROI. The ROI of that investment is going to be determined through our investigation.

Duration:

After the grant is accepted through the North Dakota Renewable Energy Program, the Planned Unit Development (PUD) process will need to begin with the city of Bismarck. The entire PUD process is likely to take 6 months to ensure proper permitting and documentation. Once approved by the city of Bismarck, construction will begin and be completed within one (1) year. Overall, the project completion process will take 18 months and then data collection will begin.

Total Project Cost:

The total cost of this project is $756,370. The cost of the two (2) homes is estimated at $668,520 ($270 per square foot) and the PV equipment and installation is estimated at $72,850. Plain View Design + Build's services will cost $15,000.

SEE APPENDIX A FOR INITIAL ESTIMATES

Participants:

Innovative Renewables, LLC

Innovative Renewables, LLC specializes in residential and commercial PV installations. They have been installing PV systems in the state of North Dakota since 2014 with over 150kW of installed PV capacity. Innovative Renewables brings years of renewable energy experience to the community and has worked on a variety of projects throughout the state of North Dakota.

Whether it is residential systems with or without backup power, off-grid hunting cabins, flat commercial roofs, ground mounts, or a decorative piece at North Dakota's Gateway to Science, Innovative Renewables has delivered innovative PV solutions to a diverse set of clients.

Plain View Design + Build

Plain View Design + Build is a residential home design and construction team that focuses on high end custom homes and large-scale remodels. Every project they take on is executed with intense commitment to meaningful designs intentionally built. Never satisfied with the status quo or good enough, their goal is to create spaces that meet our clients' unique needs, conserve resources, contribute to the community and demonstrate design excellence.

As a design + build company, Plain View's services include everything from the first sketch to the final nail. Their process is transparent, efficient and effective and always customer focused; it's the reason they created the company in 2013.

Plain View entered the market to meet the need for intentional design and construction. They were committed to creating a company that catered to clients who wanted to really think through their design decisions; clients concerned about construction impacts, opportunities and unimaginable possibilities.

Too often people settle for solutions that are within immediate reach and fall short of their true desires. They want to be known as the company that challenges clients to be bold. They are forward thinkers with an intentional approach to design. This means they are selective about the projects they accept and lean into work that gives them the best opportunity to be creative for the clients who demand it.

PROJECT DESCRIPTION

Objectives:

- Build two (2) net-zero homes with identical floor plans on the same property in Bismarck, ND that incorporate PV and battery storage and are net-zero.
    - One (1) home will be built to the city of Bismarck's building code.
    - One (1) home will be built using passive home building techniques.
- Compare differences in construction costs and determine an ROI of the cost difference for the home built using passive home building techniques versus the traditionally built home.
- Conduct an energy efficiency audit to predict expected ROI of the cost differences between the two homes.
- Install PV and battery storage systems on both homes and monitor electrical energy consumption and generation for one (1) year.
- Market this project to North Dakota's home builder associations and other trades.
- Provide access to PV and battery storage equipment for public education and private viewings.
- Develop baseline information to better understand how a passive home build will perform in the state of North Dakota.

Methodology:

Innovative Renewables, LLC and Plain View Design + Build will work together to design and build two (2) sustainable, net-zero homes that investigate passive home building techniques that also incorporates PV and battery storage technologies. One of the two homes will be built to the city of Bismarck's building code and the other home will be built using passive home building techniques. The cost differences and building techniques between the two homes will be documented. A ROI of that cost difference will both be estimated and calculated using an energy efficiency audit and monitoring electrical energy consumption and generation for one (1) year. The data collected and knowledge developed will be shared with the state of North Dakota and North Dakota's home builder associations. Access to the PV and battery storage technology would also be provided to the public education sector as well as the private sector. A digital marketing campaign would help expand the reach of this project throughout the state of North Dakota.

Anticipated Results:

The anticipated results are that this project will generate interest and create careers in the renewable energy sector within our community. This investigation will help home builders and their clients to make well-informed decisions about implementing passive home building techniques and renewable energy technology into their homes.

Facilities:

The facility in which this investigation will take place is located at 1310 E. Bowen Ave., Bismarck, ND. This location is an empty lot in Bismarck, ND that is 25' deep (N-S) and 150' wide (E-W) for a total of 3,750 ft^2. Two (2) identical homes will be built on the lot with the same floorplan but built to different building standards. Each home will contain a utility room for the PV and battery storage technology that will also collect data for the electrical energy consumption and generation monitoring.

SEE APPENDIX A FOR INITIAL BUILDING CONCEPT AND DESIGN

Resources:

Innovative Renewables, LLC has been a residential and commercial PV installer in the community since 2014. Innovative Renewables sources PV equipment from throughout the Midwest region and seldomly from the West Coast. Innovative Renewables installs the PV components and sources local electricians to ensure PV systems meet National Electrical Code (NEC) requirements.

Plain View Design + Build has been designing and building, as well as remodeling, homes and businesses in the community since 2013. Plain View employs North Dakota's only Certified Passive Home Builder and will serve as the project manager during the entire duration of the project. Plain View has great working relationships with local contractors from all trades that will ensure goals and timelines are met.

Techniques to Be Used, Their Availability and Capability:

Innovative Renewables, LLC will design and install a PV and battery storage system that will be sized appropriately for each of the two (2) homes. Product availability in the PV sector has not been an issue in the past and the PV systems will be able to manage the full electrical load of each of the two (2) homes. Innovative Renewables is located in Bismarck, ND and available year-round.

Plain View Design + Build will apply passive home building techniques as well as their decade of experience to this project. Plain View will function as the project manager to schedule and coordinate all trades involved during the construction process of the two (2) homes. Plain View is located in Bismarck, ND and available year-round.

Environmental and Economic Impacts while Project is Underway:

Environmental and economic impacts of the project will be small as most material and equipment needed during the construction process will be sourced locally or from the Midwest region.

Ultimate Technological and Economic Impacts:

Over the last decade, the installed PV and battery storage capacity in the United States has seen an exponential increase. The PV industry has developed technology that is suited for most, if not all, electrical power generation cases. The cost of PV and battery storage is often too expensive to justify the significant investment of the end user. If PV technology is incorporated into thoughtful building design and sustainable building practices, the technology may be more economical for home and business owners. The goal of this investigation is to quantify the potential savings from both an economical and environmental standpoint and determine the investment required to construct a net-zero home.

Why the Project is Needed:

The project is needed to develop baseline information that would be valuable to North Dakota's home builders as well as city and state planning divisions. The project would quantify the ROI of an investment into a passive home build versus a traditionally built home. This baseline information could be used across a variety of industries within the state of North Dakota and provide educational value to students of any age.

STANDARDS OF SUCCESS

Standards of Success should include: The measurable deliverables of the project that will determine whether it is a success; The value to North Dakota; An explanation of what parts of the public and private sector will likely make use of the project's results, and when and in what way; The potential that commercial use will be made of the project's results; How the project will enhance the education, research, development and marketing of North Dakota's renewable energy resources; How it will preserve existing jobs and create new ones; How it will otherwise satisfy the purposes established in the mission of the Program.

The measurable deliverable in this project are two (2) newly constructed homes with identical floorplans that incorporate different building techniques. The two (2) homes will both have PV and battery storage systems that will monitor electrical energy consumption and production. This investigation will establish baseline information to help North Dakota's home builders and their clients to make well-informed decisions about implementing passive home building techniques and renewable energy technology into their homes. The use of renewable energy technology and passive home building techniques will reduce the use of natural resources found in North Dakota.

Both public and private sectors will benefit from this project's results. The public education sector will be granted access to the homes to view how PV technology is incorporated into residential buildings. A digital marketing campaign is planned to generate interest and develop an understanding of PV technology and its capabilities. The private sector will also be granted access to the homes to view the PV technology and to better understand how to implement PV technology into their projects. This project is intended so that residential and commercial use of PV technology is adopted across the state of North Dakota.

The project will expose students of all ages to the project to educate them on one of the many renewable energy resources in the state of North Dakota. As mentioned throughout this application, this project is primarily focused on investigating the ROI of investing into PV technology and passive home building techniques as well as how to increase a home's energy efficiency. Baseline information is to be established after one (1) year of monitoring the electrical energy consumption and production of each home.

To go along with North Dakota's Renewable Energy Program, a major milestone of this project is to create new careers in the renewable energy sector and this project has many potential avenues to do that. The idea is that once baseline information is established, PV technology will be more widely adopted by both the residential and commercial sectors in the state of North Dakota.

BACKGROUND/QUALIFICIATIONS

Please provide a summary of prior work related to the project conducted by the applicant and other participants as well as by other organizations. ***This should also include summary of the experience and qualifications pertinent to the project of the applicant, principal investigator, and other participants in the project.***

Innovative Renewables, LLC

Innovative Renewables, LLC is owned and operated by Jay Schulte. Jay is a licensed professional electrical engineer in the state of North Dakota. Jay has a Bachelor of Science degree in electrical engineering from North Dakota State University and a Master of Science degree in renewable energy systems from Appalachian State University. Jay has held careers in the electrical design industry at Prairie Engineering, P.C., the power transmission sector at Basin Electric Power Cooperative, and in electric vehicle design at Doosan Bobcat NA. Jay has also been installing PV systems in the state of North Dakota since 2014 as a side business and also had a 1.5-year stint of installing PV systems full-time.

Innovative Renewables' first PV system was installed in Bismarck, ND in August of 2014 and was rated at 2kW. Since the first PV installation in 2014, Innovative Renewables has installed PV systems on many residential homes with and without backup power, off-grid hunting cabins, flat commercial roofs, ground mounts, and the latest was a decorative piece at North Dakota's Gateway to Science building. The largest PV system that Innovative Renewables has installed is rated at 30.4kW. Innovative Renewables approaches solutions with costs, performance, and clients' expectations in mind while also designing systems that will allow for expansion in the future.

Plain View Design + Build

Plain View Design + Build is owned and operated by Tanner Reidman and Logan Hauff. Tanner began his career in the construction industry which then led him to pursue an Architectural Drafting and Estimating degree from North Dakota State College of Science. Logan recently joined Plain View as a past University of Mary graduate with construction and commercial property risk management experience. Logan is also North Dakota's only Certified Passive House Builder and enjoys building science and optimal building practices. The combination of Tanner and Logan at Plain View Design + Build is a perfect fit for this project.

Plain View Design + Build has worked on many remodels and custom new construction builds in both the residential and commercial sector throughout the state of North Dakota. From whole home transformations, kitchen and bathroom remodels, modern farmhouses, ranch houses, or commercial restorations, Plain View's portfolio covers a variety of applications. The latest addition to Plain View's portfolio is a five-flex, referred to as the Sweet Row, located on the same city block as this proposed project. Plain View has also worked on several multi-family urban infill projects, such as the Sweet Row, throughout the city of Bismarck and has experience working with the city of Bismarck.

MANAGEMENT

*A description of **how** the applicant will manage and oversee the project to ensure it is being carried out on schedule and in a manner that best ensures its objectives will be met, **and a description of the evaluation points to be used** during the course of the project.*

Innovative Renewables, LLC is hiring Plain View Design + Build to serve as the project manager of this project. The two companies will work in conjunction during the design and planning phase of the project. Once the construction phase begins, Plain View will oversee material acquisitions and scheduling contractors to keep the project on schedule.

Plain View Design + Build will follow an established timeline after a grant is approved for this project from the North Dakota Renewable Energy Program. Plain View is currently estimating that it will take 6 months to finalize designs and complete the PUD process with the city of Bismarck. Assuming no major setbacks occur, construction will begin at the completion of the PUD process. The construction phase will follow a strict schedule with contractors lined up to ensure the project progresses at an acceptable rate. The construction timeline is expected to take one (1) year. Updates of the project's progress will be reported on a monthly basis between Innovative Renewables and Plain View. Updates will be provided to the North Dakota Renewable Energy Program as required.

TIMETABLE

Please provide a project schedule setting forth the starting and completion dates, dates for completing major project activities, and proposed dates upon which the interim reports will be submitted.

As mentioned throughout this application, the timeline for completion of this project is expected to be 1.5-years after a grant is approved. The first 6 months of the 18-month timeline will involve finalizing designs and completing the PUD process with the city of Bismarck. Construction of the Twin Solar Complex will begin at the completion of the PUD process and take one (1) year to complete. Innovative Renewables, LLC and Plain View Design + Build will meet on a monthly basis during the construction phase and interim reports will be provided to the North Dakota Renewable Energy Program as requested. Data collecting will begin upon completion of construction and will be evaluated after one (1) year.

BUDGET

*Please use the table below to provide an **itemized list** of the project's capital costs; direct operating costs, including salaries; and indirect costs; and an explanation of which of these costs will be supported by the grant and in what amount. The budget should identify all other committed and prospective funding sources and the amount of funding from each source. **Please feel free to add columns and rows as needed.** Higher priority will be given to those projects have matching private industry investment equal to at least 50% or more of total cost.*

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share
Construction	$334,260	$334,260	$0	$0
Plain View	$7,500	$7,500	$0	$0
Inn. Renewables	$36,425	$36,425	$0	$0
Total	$378,185	$378,185	$0	$0

Please use the space below to justify project associated expenses and discuss if less funding is available than that requested, whether the project's objectives will be unattainable or delayed.

Less funding would be acceptable but will cause the project's objectives to be less economical. The estimated cost of construction on the Twin Solar Complex will be revisited and finalized if this project receives a grant from the North Dakota Renewable Energy Program. Innovative Renewables, LLC and Plain View Design + Build have put together initial estimation costs of construction, but those costs will go into more detail as the project progresses. The goal is to bring the construction costs of the Twin Solar Complex down to $500,000 to make this project more economical. A reduction of square footage as well as reworking the floorplans of the complex will be evaluated.

CONFIDENTIAL INFORMATION

A person or entity may file a request with the Commission to have material(s) designated as confidential. By law, the request is confidential. The request for confidentiality should be strictly limited to information that meets the criteria to be identified as trade secrets or commercial, financial, or proprietary information. The Commission shall examine the request and determine whether the information meets the criteria. Until such time as the Commission meets and reviews the request for confidentiality, the portions of the application for which confidentiality is being requested shall be held, on a provisional basis, as confidential.

If the confidentiality request is denied, the Commission shall notify the requester and the requester may ask for the return of the information and the request within 10 days of the notice. If no return is sought, the information and request are public record.

Note: Information wished to be considered as confidential should be placed in separate appendices along with the confidentiality request. The appendices must be clearly labeled as confidential. If you plan to request confidentiality for ***reports*** *if the proposal is successful, a request must still be provided.*

To request confidentiality, please use the template available at https://www.ndic.nd.gov/renewable-energy-program/rep-applicant-council-information.

If you are not requesting confidentiality, please note that below.

N/A

PATENTS/RIGHTS TO TECHNICAL DATA

Any patents or rights that the applicant wishes to reserve must be identified in the application. If this does not apply to your proposal, please note that below.

N/A

STATE PROGRAMS AND INCENTIVES

Any programs or incentives from the State that the applicant has participated in within the last five years should be listed below, along with the timeframe and value.

N/A

Appendix

PLAIN VIEW
DESIGN + BUILD

Printed: Feb 29, 2024
212 West Main Avenue, Bismarck, ND 58501
Phone: 7014260895

Specification

Job: 2403_SCHULTE TWIN HOME
Address: 1310 East Bowen Avenue, Bismarck, ND 58501

Preliminary Project Brief

Based on Schematic Design Set 01 dated: Feb 2024

Project Brief: Residential Twin Home Infill Project

Project Title: 13th St. and Bowen Ave. Twin Home Infill

Project Overview: The 13th St. and Bowen Ave. Twin Home Infill project entails the development of two residential units on a corner lot located in Bismarck. The project aims to address the need for quality housing in the area while maximizing land use efficiency through the construction of twin homes. Each unit will feature a two-story slab-on-grade structure, offering comfortable and modern living spaces for prospective residents.

Project Location: The project site is situated at the intersection of 13th St. and Bowen Ave. in Bismarck, North Dakota. The corner lot provides an ideal location for residential development, offering convenient access to amenities, transportation routes, and neighborhood services.

Each Unit: 1238 sq. ft. of conditions space

- (1) Bed
- (2) Bath
- (1.5) off street parking

Project Scope:

1. Construction of two identical twin homes on the designated corner lot.
2. Each unit will comprise 1238 sq. ft. of conditioned living space distributed across two stories.
3. Design and implementation of modern architectural elements and landscaping to enhance curb appeal and neighborhood aesthetics.
4. Integration of energy-efficient features and sustainable building practices to promote environmental responsibility and reduce long-term operating costs.
5. Provision of essential amenities, including parking spaces, outdoor living areas, and landscaping, to ensure a high quality of life for residents.
6. Compliance with local building codes, zoning regulations, and permit requirements throughout all phases of the project.

Key Project Objectives:

1. Provide high-quality, modern residential housing options in the Bismarck area.
2. Maximize land use efficiency through the development of twin homes on the corner lot.
3. Create aesthetically pleasing and functional living spaces that enhance the surrounding neighborhood.
4. Incorporate sustainable design principles to minimize environmental impact and promote energy efficiency.
5. Ensure compliance with all relevant building codes, regulations, and permit requirements.
6. Deliver the project within the established timeline and budget constraints while meeting or exceeding quality standards.

Budget: The project budget will be allocated for various aspects, including, design and engineering, construction materials and labor, permits and approvals, landscaping, and contingencies. A detailed budget breakdown will be provided upon project commencement, with periodic updates throughout the project lifecycle to ensure financial transparency and accountability.

Stakeholders:

1. Project Owner/Developer
2. Design and Engineering Team
3. Construction Contractor
4. Local Government Authorities (Permitting and Zoning Departments)
5. Neighborhood Residents and Community Stakeholders

Preliminary Cost Estimate: Based on our past experience for projects like this we would start preliminary cost estimate range below.

Estimated Range:

1. (2) units @ 1238 sq. ft. = **$680,900 @ $270/ sq.ft.**
2. (2) units @ 1238 sq. ft. = **$792,300 @ $320/ sq.ft.**

Project Challenges:

1. **Site Constraints - Small Lot Size:** The limited size of the corner lot presents a significant challenge in designing and constructing two residential units with adequate living space and amenities. Maximizing land use efficiency while adhering to setback requirements and zoning regulations will require careful planning and innovative design solutions.
2. **Utilities and Infrastructure Integration:** Integrating utilities such as water, sewer, electricity, and gas into the existing infrastructure while minimizing disruption to surrounding properties and infrastructure presents a technical challenge. Coordination with utility providers and adherence to local regulations are essential to ensure seamless integration and functionality.
3. **Construction Logistics:** The proximity of neighboring properties and the limited space available for construction activities pose challenges in terms of site logistics, material deliveries, and worker access. Implementing efficient construction methodologies and scheduling to minimize disruptions to the surrounding neighborhood will be imperative.
4. **Community Engagement and Acceptance:** Engaging with the local community to address concerns, gather feedback, and ensure acceptance of the project is crucial for its success. Communicating the benefits of the twin home infill project and addressing any potential objections or misconceptions will require proactive outreach and transparent communication channels.

Addressing these challenges will require a collaborative approach involving all stakeholders, including the project owner, design and engineering team, construction contractor, local government authorities, and the surrounding community. By proactively identifying and mitigating potential challenges, the project can proceed smoothly and achieve its objectives effectively.

Conclusion: The 13th St. and Bowen Ave. Twin Home Infill project represents an opportunity to meet the demand for quality residential housing in Bismarck while revitalizing an underutilized corner lot. By adhering to modern design standards, sustainable practices, and community engagement principles, the project aims to create a vibrant and sustainable living environment for current and future residents.

1310 E. BOWEN AVE

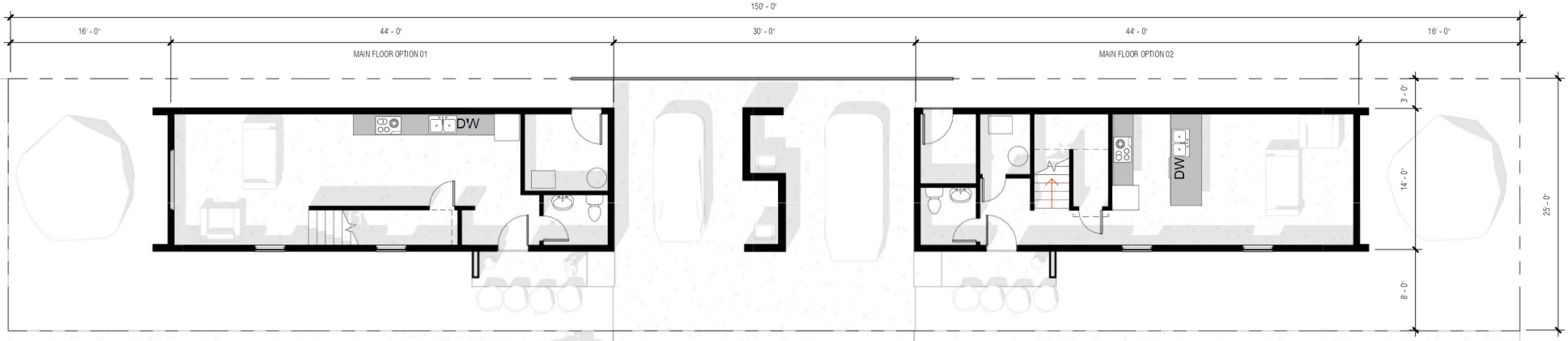
1310 E BOWEN - PRELIIMINARY

TWIN SOLAR

Project No. #PV

SCHULTE
02.08.24

1.0

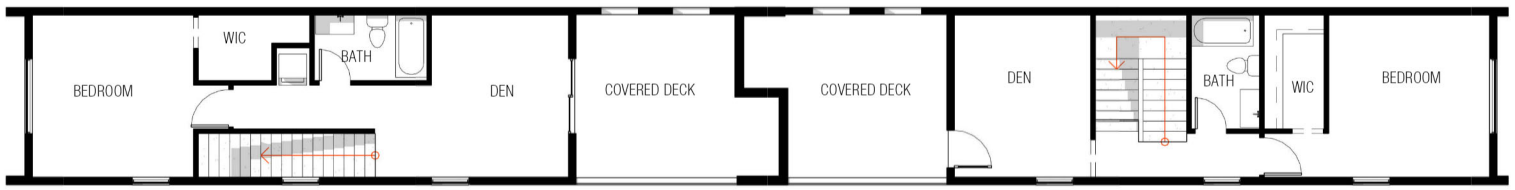


1 **01-MAIN FLOOR PLAN - SD**

Scale: 1" = 10'-0"

BUILDING AREA SCHEDULE

NAME	AREA
MAIN T.O. SUBFLOOR	
COVERED CARPORT	418 SF
UNIT A-MAIN FLOOR	616 SF
UNIT B MAIN FLOOR	616 SF



4 **02-UPPER FLOOR PLAN - SD**

Scale: 1" = 10'-0"

BUILDING AREA SCHEDULE

NAME	AREA
UPPER T.O. SUBFLOOR	
COVERED DECK	420 SF
UNIT A UPPER FLOOR	566 SF
UNIT B UPPER FLOOR	554 SF

PROJECT NOTES:

1. (1) BEDROOM PER UNIT
2. (2) BATH PER UNIT
3. 2x6 EXTERIOR MAIN FLOOR WALLS 9' 1-1/8" TALL
4. 2x6 EXTERIOR SECOND FLOOR WALLS @ 8' 1 1/8" TALL
5. SLAB ON GRADE

FLOOR PLANS

TWIN SOLAR

Project No. #PV

SCHULTE
02.08.24

1.1

ELEVATIONS

TWIN SOLAR

Project No. #PV

SCHULTE

02.08.24

1310 E BOWEN - PRELIMINARY

TWIN SOLAR

Project No. #PV

SCHULTE

02.08.24

1.3

QUOTATION

INNOVATIVE RENEWABLES, LLC
DESIGN & CONSTRUCTION

1016 Crescent Lane
Bismarck, ND 58501
(701) 400-8089

DATE: March 1, 2024
INVOICE # -

SEND TO:
Innovative Renewables, LLC
1016 Crescent Lane
Bismarck, ND 58501
(701) 400-8089

FOR: Twin Solar Complex
5.92kW Solar Install
with Battery Backup
on Each Unit

DESCRIPTION	QTY	RATE	AMOUNT
Silfab Solar, 370 Watt Panel	32.00	$ 272.88	$ 8,732.00
Sol-Ark, 15kW Hybrid Inverter, 120/240V	2.00	$ 8,437.50	$ 16,875.00
APS, Module Rapid Shutdown	32.00	$ 43.19	$ 1,382.00
APS, Single Core Transmitter	2.00	$ 184.36	$ 368.73
Fortress Power, eVault Max 18.5kWh Battery	2.00	$ 12,500.00	$ 25,000.00
PV Wire - #10 Black - 250'	1.00	$ 218.75	$ 218.75
PV Wire - #10 Red - 250'	1.00	$ 209.38	$ 209.38
Male and Female MC4 Connectors	8.00	$ 1.98	$ 15.80
Grounding Wire - #10 at 100'	1.00	$ 103.20	$ 103.20
IronRidge, XR100 Rail 17' (XR-100-204B)	14.00	$ 75.04	$ 1,050.53
IronRidge, XR100 BOSS Splice (XR100-BOSS-01-M1)	14.00	$ 9.30	$ 130.20
IronRidge, Universal Module Clamp (UFO-CL-01-B1)	68.00	$ 4.20	$ 285.60
IronRidge, Stopper Sleeve (UFO-STP-35MM-B1)	8.00	$ 0.96	$ 7.70
IronRidge, Grounding Lug (XR-LUG-03-A1)	1.00	$ 7.73	$ 7.73
IronRidge, FlashFoot2 (FF2-02-B2)	57.00	$ 15.93	$ 907.73
IronRidge, Bonding Hardware (BHW-SQ-02-A1)	57.00	$ 3.16	$ 180.26
IronRidge, XR100 End Cap (XR-100-CAP)	1.00	$ 13.63	$ 13.63
IronRidge, Microinverter Bonding Hardware (BHW-MI-01-A1)	32.00	$ 1.73	$ 55.20
IronRidge, Contour Rails (CTR-TR84-01)	16.00	$ 38.23	$ 611.60
IronRidge, Contour Hardware (CTR-CL-01)	48.00	$ 8.03	$ 385.20
Hourly Installation and Commissioning	120.00	$ 75.00	$ 9,000.00
Man Lift, 1 Week	1.00	$ 750.00	$ 750.00
Electrical Work by Electrical Contractor	1.00	-	-
		SUBTOTAL	$ 66,290.21
		TAX RATE	7.00%
		TAXABLE MATERIALS	$ 4,063.04
		ESTIMATED SHIPPING	$ 2,500.00
		TOTAL	$ 72,853.25
		TOTAL PRICE/WATT	$ 6.15
		TOTAL AFTER 2024 TAX INCENTIVE (30%)	$ 50,997.28
		TOTAL PRICE/WATT AFTER 2024 TAX INCENTIVE (30%)	$ 4.31

PROPOSAL IS VALID FOR 30 DAYS
THANK YOU FOR YOUR BUSINESS!

Industrial Commission

Tax Liability Statement

Applicant:

Innovative Renewables, LLC
1016 Crescent Lane
Bismarck, ND 58501

Application Title:

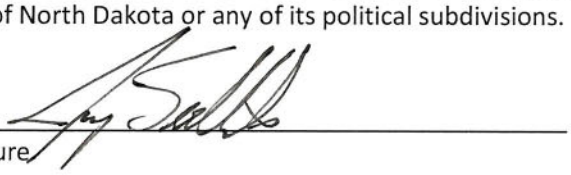
Twin Solar Complex

Program:

- ☐ Lignite Research, Development and Marketing Program
- ☑ Renewable Energy Program
- ☐ Oil & Gas Research Program
- ☐ Clean Sustainable Energy Authority

Certification:

I hereby certify that the applicant listed above does not have any outstanding tax liability owed to the State of North Dakota or any of its political subdivisions.



Signature

Owner

Title

3/1/24

Date

INDUSTRIAL COMMISSION OF NORTH DAKOTA
RENEWABLE ENERGY PROGRAM

TECHNICAL REVIEWERS' RATING SUMMARY

R-053-A
TWIN SOLAR COMPLEX
Principal Investigator: Jay Schulte
Request for $378,185; Total Project Costs $756,370

TECHNICAL REVIEWERS' RATING SUMMARY
R-053-A
TWIN SOLAR COMPLEX
Principal Investigator: Jay Schulte
Request for $378,185 Total Project Costs $756,370

		Technical Reviewer			
		1A	**2A**	**3A**	
Rating Category	**Weighting Factor**	**Rating**			**Average Weighted Score**
1. Objectives	9	2	2	2	18.00
2. Achievability	9	4	4	5	39.00
3. Methodology	7	3	3	2	18.67
4. Contribution	7	2	2	1	11.67
5. Awareness	5	1	4	4	15.00
6. Background	5	4	5	4	21.67
7. Project Management	2	3	2	1	4.00
8. Equipment Purchase	2	5	3	3	7.33
9. Facilities	2	5	3	3	7.33
10. Budget	2	2	3	2	4.67
Average Weighted Score		144	156	142	**147.33**
Maximum Weighted Score					250.00

1. **The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.**

Reviewer 1A (Rating 2)

The outcomes referenced in the proposal could already be predicted with energy audit and heatloss software for a much lower cost than the proposed grant amount.

Reviewer 2A (Rating 2)

Application talks about discovering the cost of construction of PH (passive house) techniques versus Bismarck residential code which is based on a modified 2021 IECC. This should be a known already. Well over 2000 PH structures have been built around the country. As an

energy engineer who is a CPHC (Certified Passive House Consultant) since 2009, I find this lacking.

In the NDIC area of promoting utilization of renewable energy, solar PV(photovoltaic) has seen limited success due to poor economics. The solar application in North Dakota, with utility solar farms promoted by FERC and MISO's ESG, push is artificial and not market driven. North Dakota; low solar irradiance at 4.0 kwh/m^2/day versus California; at 5.25kwh/m^2/day to upwards of 5.75kwh/m2/day. On average the big southern solar PV markets have 35 – 40% higher solar irradiance than North Dakota.

California's energy cost is 32.2 cents/kwh and New England's cost is 31cents/kwh versus North Dakota at 9.8 cents/kwh cents on average. Limited state incentives have hampered market penetration of solar PV in North Dakota due to long ROI of PV solar.

In comparison, Minnesota is at 17cent/kwh and the state requires utilities to offer **net metering**, (purchase excess Solar PV production) and sell it back in times of low PV production (winter). This has artificially grown market as homeowners don't have to buy battery storage (BESS) lowering Solar PV system cost by 50% and state offers (beyond Fed 30% tax credit) 10% state PV credit. That typical solar system without BESS provides ROI of 13 years. However, many states that offered net metering are now dropping it as it harms utilities financially and raises cost of electricity for non-solar PV homeowners.

The optimum goal of a sustainable home is to reduce the energy load by more efficient lighting, appliances, building envelope, more efficient HVAC primary equipment such as Air Source Heat Pumps & Heat Pump Tank Water Heaters, and Radiant systems designed for 40+ life span versus low first cost HVAC with 15 yr. life.

The Passive House Institute in Germany states the following regarding energy efficiency - **energy not needed** is: 1.) The most efficient, 2.) Never stops and future supply is 100% sure, 3.) Does not get more expensive over time, 4.) Lowers ownership risk and 5.) Is sustainable.

Reviewer 3A (Rating 2)

This proposal really does not address any of the NDIC's goals as it is a solar project (though is renewable energy, it is not new or unique to North Dakota) that is rather vague. The differences between Bismarck building codes and passive home building techniques is not defined as building codes typically do not define the required thermal efficiency of doors, windows or insulation.

2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.

Reviewer 1A (Rating 4)

Unless there were supply chain issues, the project should be completed in the timeline. The budget is an estimate but should cover the objectives.

Reviewer 2A (Rating 4)

I give construction cost budget a 4 as the size of the homes is small and the PV Solar is oversized for the PH envelope thus allowing Twin Solar Complex to claim both buildings will be net zero with same size solar PV is only possible if code home with one bedroom follows Bismarck's current residential code and has the planned use of an air source heat pump or air to water source heat pump, neither which has been identified as a source of space conditioning and domestic hot water.

Fargo code builders are at $400 - $425per sq. ft. so this budget in Fargo would be light. The structure is a very simple box so there should be few surprises. Long-term cost of construction

in the PH standard is currently running in $350 - $375/sq ft. in New England states where land accessibility and costs are not as high as in California.

I suggest a real time onsite data would be available from a public accessible website if project is funded and starting as soon as home is occupied.

Reviewer 3A (Rating 5)
The cited time frame (12 months) to build such a small, single roof line duplex building on a slab foundation should be more than adequate.

3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.

Reviewer 1A (Rating 3)
The methodology in the proposal is vague as far as types of software and methods that will be used in providing the final report. I would assume they will be using an accepted method but they do now describe what that will be.

Reviewer 2A (Rating 3)

I expected to see a pre-construction projection of energy use model showing PH versus Bismarck code building. By using PH Planning software, PHPP or REMRATE or REMDESIGN. It is critical to show financial feasibility early in order to show daily energy use in the first operational year how close actual operating cost goals are being met by using an active online web energy meter which would promote the technology to the public, builders, appraisers, realtors, and lending underwriters.

Cost of solar PV install looks good, but PH envelope costs should have had a projected cost per sq. ft. versus a general range that included both homes.

Reviewer 3A (Rating 2)
Very little in this proposal for comparison of building materials between the two units other than undefined Bismarck building codes and passive home building techniques (which is defined by 5 standard principles). No detail is given for construction detail of the other unit.

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Renewable Energy Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.

Reviewer 1A (Rating 2)
There is already a lot of information on these types of projects and as mentioned in #1 above the outcomes can be accurately predicted.

Reviewer 2A (Rating 2)

Without pre-construction operating costs projected the information will be reduced to one final data dump after 1 year of occupancy and miss the first operating year promotion potential. Also, it would be beneficial to see educational show-n-tell sessions planned for high school industrial arts students and college engineering students. I have conducted site training for a NDSU project managers class so this would be very valuable and motivating for students.

Future homeowners would be interested in a comfort metrics section such as MRT (mean radiant temperature), design of the envelope effective R-value, sound and vibration levels, water proofing standards, radiant symmetry of living in the PH side versus the code home. **Human Comfort can be 10 to 15 times the economic value of energy savings** per year.

Reviewer 3A (Rating 1)
Though this proposal may be an interesting comparison in side by side units, it really does not fulfil any of the NDIC's goals.

5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1A (Rating 1)
There are no documents or research activity referenced.

Reviewer 2A (Rating 4)
I have attended Midwest Renewable Energy Conference training out of Custer, WI. MRE has certified instructors that provide solar PV training and project commissioning with certifications for projects in MN, WI, IL, Iowa. I am not an active solar PV installer or design engineer.

I have not pursued PV Solar equipment area due to low economic viability in North Dakota. There is less than 20 – 25% of operational cost avoidance versus other high electricity cost markets with higher solar irradiance from the sun. I have attended 2 days of solar PV sustainable appraisal valuation best practices training and know the financial feasibility PV solar has in higher cost markets.

Reviewer 3A (Rating 4)
I have been active on several occasions in the home building trades for personal reasons. I do have a good understanding on stick-built home construction.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1A (Rating 4)
No issue with the qualifications of the individuals involved.

Reviewer 2A (Rating 5)
I have engineered over 25 high performance residential homes in last 12 years in ND, western MN, and Twin Cities market, and South Dakota working with 16 different framers where air tightness came below PH standard .6 ACH. A HERS 34 home I designed and supervised in Twin Cities market won Center Point Gas lowest cost of ownership in 2020 for a local Elk River builder. I have engineered and supervised two net zero homes with solar PV and battery storage since 2019 in FM. One came in at air tightness rating .3 ACH.

The solar PV system I sized was installed and commissioned by local electrician.

I worked over 11 years for Honeywell in North Dakota and Western Minnesota area and implemented and conducted maintenance & verification audits, lead design team on over 55 performance contract projects with 10+ year operating cost saving guarantees. The largest was the $20,000,000 HVAC renovation at Grand Forks Air Force Base; most complex was total plant automation upgrade of Case New Holland plant in Fargo.

I am a recognized residential construction trainer for MN CE classes in Fargo and Twin Cities market since 2017. With Honeywell I received multiple awards for expertise in marketing, finance, mechanical engineering design, and digital control technologies.

The Fargo energy efficiency classes were done with Sandra Adomatis.SRA who is the Appraisal Institute's lead trainer on green buildings and co-author of the appraisal form 820.06 green addendum and author of Residential Green Valuation Tools.

Reviewer 3A (Rating 4)
As above, I have been personally involved in the construction of stick-built homes both in the past and currently in a different state (which will, no doubt, have slightly different building codes).

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 1A (Rating 3)
The main part of the management plan is to be developed upon receipt of the grant.

Reviewer 2A (Rating 2)
Not well defined but alluded they would communicate between subs and design team weekly. No project Gantt chart of project milestones and Test & Balance inspections.

Reviewer 3A (Rating 1)
Other than stating it will take 18 months from the receipt of the grant support (6 months to deal with Bismarck on building codes and 12 months to complete), there are not any cited milestones of typical home construction.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 1A (Rating 5)
No Comments.

Reviewer 2A (Rating 3)
Minimum detail on each building envelope, ACH goals, R-value, fenestration U-value, type of HVAC system proposed in the conventional slab-on-grade home**.**

Reviewer 3A (Rating 3)
The equipment cited to be purchased has to do with the installation of solar panels to provide each unit with electricity. This really does not qualify as "equipment purchased for this project".

9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 1A (Rating 5)
No comments.

Reviewer 2A (Rating 3)
As this is to highlight PV-Solar they did a good job here.

But the building structure provided little material and performance rating detail with a 'wait and see' and 'we'll inform you as we go' approach.

The second reason for '3' score is it is essential to have this information early before a construction loan is approved. An assigned appraiser without this information can't do pre-appraisal on behalf of the lender that the lender uses to justify construction loan with additional energy efficiency improvements.

It is important that a builder understands how a lender works; how an appraiser is assigned early by the lender's underwriting department; a builder should also be aware of HUD 4001 lender guidelines. A builder or assigned energy auditor should also do a building heat /cooling load analysis that a HERS rater produces using Rem-rate software which can provide the appraiser valuable data as part of green addendum data for the pre-construction appraisal the lender uses to approve the construction loan.

This information is provided to show the challenges that a demonstration project will face before it has market acceptance of new and better construction technologies and practices.

Reviewer 3A (Rating 3)
The building has been designed for the lot the contractor has chosen to build the duplex upon.

10. The proposed budget "value"[1] relative to the outlined work and the financial commitment from other sources[2] is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 1A (Rating 2)
As mentioned above, this is a very high cost to obtain the results referenced in the proposal.

Reviewer 2A (Rating 3)

I give it an average 3 rating as I see actual residential home cost per square foot coming in 15% to 25% higher for the following reasons:

Most new homes have 8 to 12 outside corners and multi-levels of ceiling and bump outs. The homes in the proposal are very simple and help keep construction costs down. The typical client for a sustainable home will be upper income, highly educated, and expect much more design and style that will drive up costs and reduce ROI. In Twin Cities market 15 PH homes are designed for each one that actually is built due to the high design and construction cost.

Reviewer 3A (Rating 2)
The proposal really does not fit the goals at all. The builder is willing to put up 50% of the estimated cost of construction which does fit the guidelines.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 1A
There are already a lot of studies and information available on projects like this. For this reason and for the reasons I have given in the comments above, I do not recommend funding the project.

Reviewer 2A

I do not recommend funding this project without major changes.

These efficiency projects should happen in a North Dakota market where existing market infrastructure has been developed such as builder training, realtor training, live green fields in MLS, existing sustainable (green) appraisers, lenders with sustainable appraisers in underwriting department. The FM market is barely there with over 6 years of focused work. This work hasn't been done in Bismarck. Xcel Energy has shepherd this training in the Twin Cities market with good success funding up to $3,500 per new home and providing heat load analysis.

I recommend dividing the potential funding of matching funds for the Twin Solar project so that 4 demonstration projects happen simultaneously in 4 communities with higher education facilities such as Bismarck, Fargo, Grand Forks, and Minot. I have consulted in the past with quality contractors in Bismarck, Minot, Grand Forks, and Fargo and feel a multi-city energy efficient home project could be coordinated. There is also a need to provide subsidized training for realtors and appraisers to get NAR green designation in each of these markets as these professionals are your marketing force, not the builders. The Realtors own the MLS database.

There are new career academy centers in most of these metro areas and this would be a great extension of this education process. I have already been working with NDSCS on assisting on an education task force for designing the training that would apply to future workers for Fargo-West Fargo home builders.

A state-wide initiative, would help motivate the lenders to understand sustainable buildings and realtors to complete their green training and start utilizing and inputting green field data.

The federal IRA Act will provide 10 years of federal energy efficiency incentives and a state-wide demonstration project would benefit most of the state. Net Zero Ready Homes would be an attainable goal by most builders without added expense of Passive House.

In 2020 the Chicago based non-profit 'Elevate Energy' funded an appraiser led study of 3 metro areas: Minneapolis-St. Paul, Chicago metro, and Detroit and lower Michigan. This study revealed over 40,000 Energy Star homes in MSP market and over 4300 LEED commercial buildings. Almost no homes (less 200) showed up in Northstar MLS. However homes below HERS 50 sold for 10% premium even without any previous realtor training at the time. It proved consumer demand is there. A pdf copy is available.

Reviewer 3A

This proposal just does not fit the NDIC's goals at all. The overall cost of construction for such a small building with a single roofline, two story, one bedroom, 1 ½ bath (the proposal erroneously cites 2 bathrooms which it does not have), no garage (because the chosen location is too narrow to install one) efficiency kitchen and utility room accessible only from outside seems to be outrageously excessive. It is not handicap accessible. Also, the proposal **does not** account for the income that the developer will gain upon the sale of these properties which will offset any of the financial commitment they are citing in this proposal. The use of solar energy is not unique to North Dakota and is **not** a part of the NDIC's goals to promote. I seriously doubt that this property will access for the three quarters of a million dollars that is cited necessary for construction.

On the positive side, this could provide some interesting analysis of the value of passive home building techniques. However, the proposal needs to quantify all the variables that can be encountered in stick-build home construction in order to truly track the economic differences.

Energy & Environmental Research Center
15 North 23rd Street, Stop 9018 • Grand Forks, ND 58202-9018 • P. 701.777.5000 • F. 701.777.5181
www.undeerc.org

March 1, 2024

Mr. Reice Haase
Deputy Executive Director
ATTN: Renewable Energy Program
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Dear Mr. Haase:

Subject: EERC Proposal No. 2024-0126 Entitled "Regional Electric Vehicle Infrastructure Resiliency (REVIR) Plan"

The Energy & Environmental Research Center (EERC) of the University of North Dakota (UND) is pleased to submit this cost-share funding request to the Renewable Energy Program (REP) for the support of the REVIR plan project. The 2-year project has been selected for award by the U.S Department of Energy with a start date of May 1, 2024. The EERC is committed to completing the project on schedule and within budget should the Commission make the requested grant.

The EERC, a research organization within UND, an institution of higher education within the state of North Dakota, is not a taxable entity; therefore, it has no tax liability.

The $100 application fee (Check No. 2765) for this proposal was sent UPS overnight and was delivered Thursday, February 29, 2024, UPS tracking number 1ZX571891399267934. If you have any questions, please contact me by telephone at (701) 777-5105 or by email at dselvaraj@undeerc.org.

Sincerely,

DocuSigned by:
Daisy Selvaraj
7921E3286EF8479...
Dr. Daisy Selvaraj
Senior Research Engineer, EERC

Approved by:

DocuSigned by:
20499751F2B84D7...
Charles D. Gorecki, CEO
Energy & Environmental Research Center

DS/kl

c: Karen Tyler, North Dakota Industrial Commission

Renewable Energy Program

North Dakota Industrial Commission

Application

Project Title: Regional Electric Vehicle Infrastructure Resilience (REVIR) Plan

Applicant: Energy & Environmental Research Center, University of North Dakota

Principal Investigator: Dr. Daisy Selvaraj

Date of Application: March 1, 2024

Amount of Request: $375,000

Total Amount of Proposed Project: $1,875,000

Duration of Project: 24 Months

Point of Contact (POC): Dr. Daisy Selvaraj

POC Telephone: (701)-777-5105

POC Email: dselvaraj@undeerc.org

POC Address: 15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

TABLE OF CONTENTS

ABSTRACT

As electric vehicle (EV) charging infrastructure grows, resiliency planning will be critical to ensure that communities and energy systems are prepared for disruptive natural and manmade events that could compromise access to charging services. Such planning will foster EV sector growth, catalyze investment to diversify North Dakota's economy, expand use of renewable energy resources, and create renewable energy jobs, wealth, and tax revenues. **Objective:** The Energy & Environmental Research Center (EERC) will lead a consortium of regional stakeholders to develop a Regional Electric Vehicle Infrastructure Resilience (REVIR) plan that has broad support to serve as an actionable, adaptable, and evolving road map to strengthen and maintain secure, reliable, and resilient EV infrastructure in the four-state region (North Dakota, Montana, Minnesota, and South Dakota). **Expected Results:** The REVIR plan will support the North Dakota Industrial Commission (NDIC) Renewable Energy Program's (REP's) mission to promote the growth of North Dakota's vast renewable energy industries through research, development, marketing, and education. The resulting REVIR plan will map the developed networks and working

relationships among stakeholders, communities, and EV interest groups. The proposed work will provide guidance on resilience solutions to enhance the state's EV infrastructure plans as part of the National Electric Vehicle Infrastructure (NEVI) program [1] and other EV programs that can diversify North Dakota's economy, promote its renewable energy resources, and create jobs. **Duration:** 24 months, with an anticipated start date of May 1, 2024. **Total Project Cost:** $1,875,000, with $375,000 from NDIC REP, and $1.5 million from the Joint Office of Energy and Transportation (JOET) within the U.S. Department of Energy (DOE). **Participants:** ND Department of Transportation (DOT), MNDOT, MTDOT, ND Clean Cities, MN Clean Cities Coalition, ND Department of Commerce, ND Department of Emergency Services, MT Department of Environmental Quality, Fargo – Moorhead Metropolitan Council of Governments, Cass County Electric Cooperative, Mountrail–Williams Electric Cooperative, Xcel Energy, ZEF Energy, Connexus Capital LLC, SAGE Development Authority, and Native Sun Community Power Development.

PROJECT DESCRIPTION

The four-state region of Minnesota, Montana, North Dakota, and South Dakota encompasses a unique combination of EV infrastructure resilience challenges including harsh winter climate, extreme weather events, limited rural distribution grid infrastructure, lack of charging infrastructure, and low EV adoption. By leveraging U.S. Department of Energy (DOE) funds and coordinating with ongoing EV charging infrastructure build-out work and programs of the states' DOTs, charging network operators, utilities, planning departments, and community groups, the project team will build a consortium of stakeholders to identify, assess, and devise mitigation strategies to address risks specific to the regional EV charging infrastructure. With the goal of providing practical, achievable, and affordable mitigation strategies, project outcomes will translate to increased charging infrastructure resilience throughout the region. The proposed community benefits plan (CBP) will include sustained engagement with stakeholders, including representatives of tribal nations and disadvantaged communities, to invite participation in actively influencing REVIR plan development.

Objectives. The primary objective of this proposed effort is to provide technical assistance in developing the REVIR plan by 1) facilitating coordination between interstate, intrastate, and community-level working groups and stakeholders to plan for, respond to, and recover from anticipated and unanticipated disruptions to charging infrastructure availability and services; 2) identifying and addressing regional EV charging risks and providing mitigation strategies for ensuring maximum regionwide EV infrastructure reliability, resilience, and security; and 3) providing guidance to communities and stakeholders in preparing for and adapting to technological and socioeconomic developments in transportation electrification and implementing resilience solutions. Developing, nurturing, and strengthening these relationships will be essential to achieve project objectives and will enable effective response to longer-term opportunities and challenges in the energy industry.

Methodology. The project team will accomplish the proposed work by following a project structure that focuses on engagement and dialogue with all stakeholders involved. As depicted in Figure 1, the REVIR plan project is designed to feed and coordinate with other efforts in the region. The task structure is developed to provide consistency with the matching project awarded by the Joint Office of Energy and Transportation within the DOE.

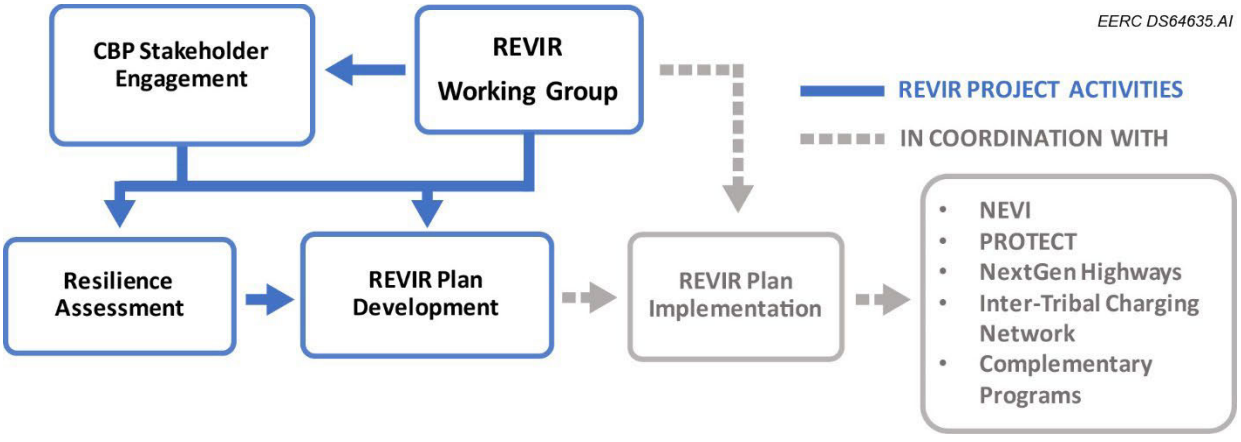


Figure 1. Proposed REVIR plan project approach.

Task 1 – Creation and Coordination of the REVIR Working Group (RWG). Resilience planning requires active participation from local government and community representatives, officials, private industries,

and local businesses who have a diverse range of perspectives on EVs and EV infrastructure. An RWG will be created to provide a critical resource for data, technical analysis, and solutions. The RWG will offer strategic leadership, direction, stakeholder engagement, and assistance in REVIR plan development and recommendations for implementing resilience solutions for the regional EV infrastructure. Table 1 lists committed RWG members. Other members may be added over the course of the project.

Table 1. RWG Members

Transportation	Nongovernmental Energy and Consulting
• ND Department of Transportation • MN Department of Transportation • MT Department of Transportation • MN Clean Cities Coalition • ND Clean Cities	• Cass County Electric Cooperative • Mountrail–Williams Electric Cooperative • Xcel Energy • ZEF Energy • Connexus Capital LLC
Other State and Regional Agencies	**Tribal Relations**
• ND Industrial Commission • ND Department of Commerce • ND Department of Emergency Services • MT Department of Environmental Quality • Fargo–Moorhead Metropolitan Council of Governments	• SAGE Development Authority (Standing Rock Sioux Tribe) • Native Sun Community Power Development (Red Lake Nation)

Task 2 – CBP Implementation and Stakeholder Engagement. The effort will focus on gathering stakeholder input by identifying and engaging stakeholders, e.g., communities, government agencies, and other groups; industries such as charging station manufacturers/owners, network operators/providers, and EV manufacturers; local businesses, utilities, and policy makers. The CBP will lay the groundwork for a resilient EV charging infrastructure that supports broadly shared prosperity for communities, including workers and tribal nations, by doing the following:

- Soliciting input on goals, current and potential activities, and potential resources for executing the REVIR plan, such as knowledge sharing, lessons learned, and best practices.
- Leveraging outreach by partners to identify stakeholders to participate in plan development.
- Informing stakeholders about EV charging resilience, planning process, and benefits.

The stakeholder engagement activities will include meetings with communities, site hosts, and focus groups; listening sessions; surveys/questionnaires; and information sharing through websites.

Task 3 – Baseline and Risk Assessment of Regional EV Infrastructure. A robust resilience assessment framework is critical for assessing various threats and risks and developing and implementing solutions to address those risks and enhance resilience of the charging infrastructure. Illustrated in Figure 2, development of the framework begins with a *baseline assessment* to understand the current state of the regional EV infrastructure and energy systems and ends with identifying *risk mitigation* strategies. Examples of *threats* are provided in Table 2. *Vulnerabilities* are weaknesses within the charging infrastructure, processes, and supporting systems that may contribute to severe damage when a disruptive event occurs (e.g., lack of cyber defense leads to major economic loss or disruption of critical infrastructures).

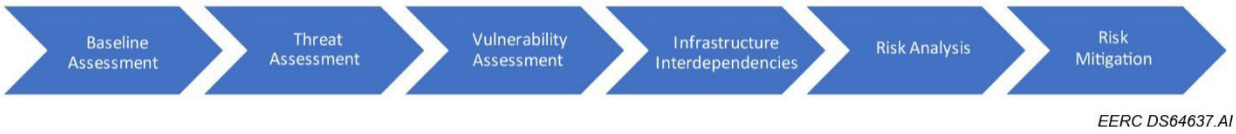


Figure 2. Steps to develop a resilience assessment framework.

Table 2. Threat Categories and Examples

Threats	Examples
Natural	Cold waves, snowstorms, high winds, floods, tornadoes
Technological	Electrical power outages, communication interruption, equipment breakdown
Manmade	Cyberattacks, accidents, vandalism, supply chain interruption

The RWG will consider stakeholder input in modeling additional threat scenarios as applicable to the regional charging infrastructure. For *risk analysis*, Idaho National Lab's (INL's) All Hazards Analysis (AHA) tool [2] will be used to simulate the regional threat scenarios and vulnerabilities and analyze the regional risks to the charging infrastructure. Potential mitigation options to reduce vulnerabilities and threats will be assessed for effectiveness along with viability, cost, and potential to reduce risk. The preliminary findings of the risk assessment will be compiled in a draft report to inform stakeholders about the regional EV infrastructure threats, vulnerabilities, and challenges and will be valuable for

involving stakeholders in the subsequent development of resilience solutions (i.e., mitigation strategies). The findings of the risk assessment will be used to 1) refine REVIR plan goals, strategies, and actions that facilitate building a resilient EV infrastructure; and 2) ensure that the REVIR plan is focused on addressing the threats and vulnerabilities and proposing practical solutions.

Task 4 – Development of REVIR Plan. The REVIR plan for the four-state region will comprise the process flow presented in Figure 3. Through stakeholder engagement, the RWG will develop meaningful short- and long-term goals and innovative strategies for translating the conceptual resilience vision to practical and achievable resilience solutions. Clear goals and proactive strategies to achieve these goals will be the foundation for the comprehensive design of the REVIR plan, help communicate efforts to stakeholders, and provide a basis for tracking and measuring success. The REVIR plan will also provide guidance on the implementation of mitigation strategies that include the following components: 1) responsible agency/community, 2) collaborators/partners, 3) preliminary steps for implementation, 4) resources required, 5) potential barriers, and 6) estimated timeline. Stakeholder feedback will inform the final REVIR plan.

Figure 3. Process flow of REVIR plan development.

Task 5 – Project Management and Reporting. This task will include all quarterly, interim, and final reporting to project sponsors, including deliverables. Results will be provided in interim and final project reports and at one or more technical conferences.

Anticipated Results. The project will support REP's mission to promote the growth of North Dakota's vast renewable energy industries through research, development, marketing, and education. The primary result will be a REVIR plan that showcases the networks and working relationships among stakeholders, communities, and EV interest groups. The proposed work will provide guidance on resilience solutions to enhance the state's EV infrastructure plans as part of the NEVI program and other

EV programs underway that can diversify North Dakota's economy, create renewable energy jobs, and promote the use of North Dakota's renewable energy resources.

The primary long-term impact of the REVIR plan will be its use as an adaptable tool and framework for enhancing regional EV charging infrastructure reliability, resiliency, and accessibility as EV adoption increases and user patterns and markets evolve. In addition, the working relationships, organizational networks, and engendered trust established during the project will yield beneficial interdependencies and communication pathways that will facilitate preparing for and responding to disruptive events, technology improvements, evolving regulatory environments, social and demographic changes, and other as-yet unforeseen developments in transportation electrification.

Facilities and Resources. The EERC office and meeting rooms will be the main work location. The EERC's computers, communication networks, and clusters can support data storage, analysis, and simulation activities. The other project partners have the facilities and resources available to complete the scope of work. The project team will draw on research experience in infrastructure resilience assessments and electrical-grid-related impacts from EV adoption. In addition, the four states' DOTs have ongoing intrastate efforts to build the EV charging structure under federal programs including the NEVI program, the Promoting Resilient Operations for Transformative Efficient and Cost-saving Transportation (PROTECT) program, and the NextGen Highways program. The proposed work will leverage their collaboration with utilities, planning divisions, state agencies, charging network providers, charger manufacturers, fleet managers, local and tribal communities, and emergency services departments to help develop and implement the REVIR plan. The work will integrate the efforts of nongovernmental infrastructure development. SAGE Development Authority of the Standing Rock Sioux Tribe, Connexus Capital, ZEF Energy, and Native Sun Community Power Development have experience working on the charging network between the Standing Rock Sioux Tribe and Red Lake Nation in Minnesota. Xcel Energy, Cass County Electric Cooperative, and Mountrail–Williams Electric Cooperative will provide

utility perspectives on EV charging demand, load growth, and grid reliability issues. ND Department of Emergency Services manages the state's Critical Infrastructure Program and will inform emergency planning. ND Clean Cities, MN Clean Cities Coalition, Fargo–Moorhead Metropolitan Council of Governments, ND Department of Commerce, and MT Department of Environmental Quality will support REVIR plan development. No equipment will be purchased for this project.

Techniques To Be Used, Their Availability and Capability. The project will use INL's AHA tool for resilience assessment, which INL has agreed to provide with required data on regional infrastructures.

Environmental and Economic Impacts while Project is Underway. The project comprises data gathering and analysis, computer simulation modeling, surveys/questionnaires, and paper studies. Environmental and economic impacts of the project will be minimal.

Ultimate Technological and Economic Impacts. The proposed project will support North Dakota's vision to promote the growth of North Dakota's renewable energy industries by improving the resiliency and thus increasing the reliability of electrified transportation. The proposed work will guide implementation of resilience solutions that can promote investment in EV infrastructure with the forethought to integrate resiliency, reliability, and security as well as partner with stakeholders who seek to develop resilient and independent energy systems into the future. The proposed project will foster sustainable growth of a resilient EV sector that can diversify North Dakota's energy economy, better leverage renewable energy resources, and create additional energy- and transportation-related jobs.

Why the Project Is Needed. North Dakota has a unique combination of EV infrastructure resilience challenges, including expansive sparsely populated geography, harsh winter climate, extreme weather events, personal-vehicle-dominated road transportation, and limited rural electric grid infrastructure. The region has relatively low EV adoption compared to national trends. Many of the plug-in-electric vehicles (PEVs) registered in the region are found in major urban areas, with few vehicles present in the more rural areas. The region also has limited EV charging infrastructure. Considering the number of

public charging ports per 10,000 people for each state, the average figure for North Dakota is 2.3, which is less than the national average of 2.9 ports/10,000 people and far less than leading states (e.g., about 7–21 in California) [3-4]. Most of the region has less than one charging station for every 50 miles along the designated alternative fuel corridors. Because of the lack of EV charging infrastructure, the study region is referred to as a charging desert, and this may cause concerns to EV-driving road trippers and tourists. Given the low EV adoption and minimal EV infrastructure deployment to date, resilience and reliability issues have yet to emerge. The REVIR plan will facilitate the proactive development of a built-from-scratch resilience system, saving time, money, and lives in the future.

By leveraging and coordinating with ongoing EV charging infrastructure build-out work and programs of the states' DOTs, charging network operators, utilities, planning departments, and community groups, the project team will lead a consortium of stakeholders to identify, assess, and devise mitigation strategies to address risks specific to the regional EV charging infrastructure. With the goal of providing practical, achievable, and affordable mitigation strategies, project outcomes will translate to increased charging infrastructure resilience throughout North Dakota and the four-state region and will offer significant applicability to resilience plans for other regions. The proposed work will provide guidance on the implementation of resilience solutions to enhance state DOT EV infrastructure plans as part of the NEVI program, PROTECT program, NextGen Highways program, and intertribal charging networks already underway in the region.

STANDARDS OF SUCCESS

Success first requires delivery of a REVIR plan that has sufficiently broad and deep stakeholder support to serve as an actionable, adaptable, and continually evolving road map for strengthening and maintaining a secure, functioning, and resilient EV infrastructure in North Dakota and the region. The success metric will be the extent to which REVIR plan stakeholders and EV users are committed to implementing and building on the plan, as demonstrated by willingness to fund and participate in

postproject working group(s) as needed to 1) keep the plan alive, 2) turn its directives and strategies into actions, and 3) achieve its objectives in the form of infrastructure, hardware, grid and resource management, operational strategies and policies, outreach and education, and increased EV adoption.

The resilience of EV charging stations will depend directly on the resilience of the electric utility serving the charging station. A substantial weather-induced power outage could shut down charging infrastructure and compromise consumer access with likely economic implications. In addition to weather and other uncontrollable threats, large-scale variations in demand profiles caused by unmanaged EV charging loads may lead to grid resource adequacy shortfalls and create needs for planned, rolling blackouts. A primary REVIR plan objective is to help build and maintain working groups (comprising EV industry, user, and community stakeholders) capable of 1) monitoring charging infrastructure use and performance, 2) regularly assessing risks to infrastructure availability, and 3) developing and implementing mitigation strategies to maximize infrastructure reliability and minimize downtime following an unavoidable shutdown.

VALUE TO NORTH DAKOTA

According to the Lignite Energy Council, over half of the electricity generated in North Dakota goes to out-of-state customers, most to Minnesota. Minnesota's new carbon-free energy standard (enacted by Minnesota lawmakers in 2023) requires Minnesota utility providers to transition to 100% carbon-free electricity sources by 2040. Twin Cities EV users will likely soon represent a major new and fast-growing power demand center. Therefore, demand for low-carbon power is growing in the immediate region. Cross-state industry–user–community alliances formed and guided by a working/living REVIR plan will help ensure continuing and expanded flow of North Dakota power to Minnesota, South Dakota, and Montana customers, benefiting North Dakota and its neighbors. Build-out of EV infrastructure will also yield greater connectivity within the region, allowing for EV travel corridors that enhance tourism

opportunities and ensuring economic stability, growth, and opportunity in the renewable energy industry.

BACKGROUND/QUALIFICIATIONS

The EERC will draw on extensive experience successfully managing multimillion-dollar contracts involving myriad regulatory, industry, and nongovernmental partners to lead the project and manage tasks with input and support from the project partners to accomplish task goals and objectives. The principal investigator (PI) is Dr. Daisy F. Selvaraj, Senior Research Engineer at the EERC. Dr. Selvaraj will manage the project planning and reporting activities. Her research focuses on energy infrastructure risk and resilience assessment, distribution system planning and analysis, load flow and hosting capacity analysis, studies on distributed energy resources (DER) impacts, and production cost and energy market simulations. Dr. Selvaraj will be assisted by Mr. Bradley G. Stevens, Principal Research Engineer, Civil Engineering at the EERC. Mr. Stevens' principal areas of interest and expertise include soil, groundwater, and industrial process water remediation; process instrumentation and control; wind power generation; hydrogen production; and oil and gas production. Dr. Selvaraj and Mr. Stevens worked on the development of a North Dakota grid resilience plan. The team's prior work also includes the Military Installation Resilience Study for the Grand Forks Air Force Base. Ms. Charlene R. Crocker, Senior Research Scientist and Outreach Team Lead at the EERC, will lead Task 2. Ms. Crocker's principal areas of interest and expertise span public outreach and scientific research activities over more than 30 years, including energy transformations and emissions control, CO_2 capture and storage, and water quality. Resumes of key personnel can be found in Appendix A.

MANAGEMENT

The EERC will oversee all tasks, schedule regular internal and external meetings with project participants, and ensure that the project is conducted using acceptable scientific methodologies and practices in accordance with the project plan (budget, schedule, and deliverables) and is meeting quality

objectives. The EERC will keep all partners informed of project progress, coordinate activities for successful project execution, and be responsible for timely submission of all project deliverables and products to the project team. Progress reports will be prepared and submitted to project sponsors for review. A broad team approach is key to successful execution of this project.

TIMETABLE

This project will be performed over 24 months. It is anticipated that DOE funds will be available by May 1, 2024, to initiate the project. Figure 4 depicts the proposed project schedule.

	Year 1				Year 2			
Tasks	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Task 1 – Creation and Coordination of REVIR Working Group (RWG)								
Task 2 – CBP Implementation and Stakeholder Engagement								
Task 3 – Baseline and Risk Assessment of Regional EV Infrastructure								
Task 4 – Development of REVIR Plan								
Task 5 – Project Management and Reporting								

Figure 4. Proposed project schedule.

BUDGET

The total estimated cost for the proposed work is $1,875,000, as presented in Table 3. The EERC requests $375,000 from REP to be matched with $1,500,000 from JOET within DOE. Letters of support are provided in Appendix B. Budget notes can be found in Appendix C.

TAX LIABILITY. The EERC is a business unit within UND, which is a state-controlled institution of higher education and is not a taxable entity; therefore, the EERC has no tax liability.

CONFIDENTIAL INFORMATION. No confidential information is included in this proposal.

PATENTS/RIGHTS TO TECHNICAL DATA. It is not anticipated that any patents will be generated during this project. The rights to technical data generated will be held jointly by the EERC and project sponsors.

STATE PROGRAMS AND INCENTIVES. A listing of EERC projects funded by NDIC in the last 5 years can be found in Appendix D.

REFERENCES. All references cited are in Appendix E.

Table 3. Budget Breakdown

Project Associated Expense	NDIC Share (Cash)	DOE Share (Cash)	Total Project
Direct Costs			
Labor	$239,514	$801,638	$1,041,152
Travel	$–	$26,072	$26,072
Supplies	$800	$6,970	$7,770
Subcontractor – Matthew Stolz	$–	$40,000	$40,000
Communications	$–	$6,566	$6,566
Printing and Duplicating	$–	$2,926	$2,926
Food	$–	$2,508	$2,508
Rents and Leases – Venue Rental	$–	$1,200	$1,200
Honorarium	$–	$2,000	$2,000
Document Production Services	$7,130	$98,318	$105,448
Technical Software Fee	$–	$8,996	$8,996
Engineering Services Fee	$900	$9,796	$10,696
Total Direct Costs	$248,344	$1,006,990	$1,255,334
Facilities and Administration	$126,656	$493,010	$619,666
Total Project Costs	**$375,000**	**$1,500,000**	**$1,875,000**

APPENDIX A

RESUMES OF KEY PERSONNEL

DR. DAISY F. SELVARAJ
Senior Research Engineer
Energy & Environmental Research Center (EERC), University of North Dakota (UND)
15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA
701.777.5105, dselvaraj@undeerc.org

Education and Training

Ph.D., Electrical Engineering, Visvesvaraya Technological University, Belagavi, India, 2018.
M.E., High-Voltage Engineering, College of Engineering Guindy, Anna University, Tamil Nadu, India, 2008.
B.E., Electrical and Electronics Engineering, Bharathidasan University, India, 1999.

Research and Professional Experience

2022–Present: Senior Research Engineer in the Energy Systems Group at the EERC, UND. Dr. Selvaraj's research focuses on distribution system planning and analysis, load flow and hosting capacity analysis, studies on distributed energy resources (DER) impacts, and production cost and energy market simulations. Her current research activities include a grid resilience study for the State of North Dakota and also energy storage modeling for a U.S. Department of Energy (DOE) project on ammonia storage. As a competent researcher and technical leader, Dr. Selvaraj has created strong collaborative engineering teams with national labs, government agencies, and utility partners. She has developed a number of new ideas and proposals over the years that led to successful research and business capabilities and subsequent funding from federal and state agencies. In addition, Dr. Selvaraj teaches Electrical Engineering graduate and undergraduate courses in the UND Department of Electrical Engineering as well as provides academic advising and mentoring to students.

2019–2022: Research Engineer, EERC, UND.

2018–2019: Postdoctoral Research Associate, School of Electrical Engineering & Computer Science, UND.

2017–2018: Assistant Professor, Department of Electrical and Electronics Engineering, Presidency University, Karnataka, India.

2013–2017: Senior Research Fellow, R&D Management Division, Central Power Research Institute, Karnataka, India.

2010–2013: Assistant Professor, Department of Electrical and Electronics Engineering, Rajiv Gandhi Institute of Technology, Karnataka, India.

2006–2008: Master's Degree Candidate, College of Engineering Guindy, Anna University, Tamil Nadu, India.

2003–2006: Lecturer, Department of Electrical and Electronics Engineering, J.J College of Engineering and Technology, Tamil Nadu, India.

2002: Production Engineer, Baby Industries, Tamil Nadu, India.

2000–2001: Programmer, Sierratronic India Pvt. Limited, Tamil Nadu, India.

Professional Activities

Member, Institute of Electrical and Electronics Engineers (IEEE)
Member, Indian Society for Technical Education
Reviewer, *IEEE Access*
Reviewer, DOE Artificial Intelligence and Decision Support for Complex System Review, July 2020.
Session Chair, Special Session on Electric Vehicles, Emerging Topics Track, 2019 North American Power Symposium (NAPS), Wichita, Kansas, USA, October 2019.
Reviewer, 2019 NAPS, Wichita, Kansas, USA, October 2019.
Reviewer, *IEEE Wireless Communications Magazine*
Reviewer, *IEEE Access*
Reviewer, *Elsevier Thermal Science and Engineering Progress*
Reviewer, *Elsevier Corrosion Science*
Reviewer, *MDPI Energies*

Publications

Mehrasa, M.; Salehfar, H.; Selvaraj, D.F.; Ahmed, S. I. Smart Bidirectional Charging for Frequency Support of a Low-Inertia Vehicle-To-Grid System in Presence of Energy Storage Systems Paper presented at 2023 IEEE Texas Power and Energy Conference (TPEC), College Station, TX, USA, 2023, pp. 1–6, doi: 10.1109/TPEC56611.2023.10078605.

Mehrasa, M.; Selvaraj, D. F.; Salehfar, H. Robust Control Strategy for a High-Power Off-Board EV Charger Connected to Grid-Tied Critical Loads. Paper presented at 2023 IEEE TPEC, College Station, TX, USA, 2023, pp. 1–6, doi: 10.1109/TPEC56611.2023.10078516.

Ibne Ahmed, S.; Salehfar, H.; Selveraj, D.F. Grid Integration of PV Based Electric Vehicle Charging Stations: A Brief Review. Paper presented at 2022 North American Power Symposium (NAPS), Salt Lake City, UT, USA, 2022, pp. 1–6, doi: 10.1109/NAPS56150.2022.10012159.

Mehrasa, M.; Hajar, K.; Razi, R.; Labonne, A. Fuzzy Logic-Based Charging Strategy for Frequency Control of an Electric Vehicles-Integrated Weak Grid. Paper presented at 2022 IEEE International Conference on Electrical Sciences and Technologies in Maghreb (CISTEM), Tunis, Tunisia, 2022, pp. 1–6, doi: 10.1109/CISTEM55808.2022.10044057.

Ahmed, S.I.; Salehfar, H.; Selvaraj, D.F. PV Hosting Capacity Assessment for Improved Planning of Low-Voltage Distribution Networks. Paper presented at 2021 NAPS, College Station, TX, Nov 14–16, 2021. DOI: 10.1109/NAPS52732.2021.9654614.

Ahmed, S.I.; Salehfar, H.; Selvaraj, D.F. Impact of Electric Vehicle Charging on the Performance of Distribution Grid. Paper presented at 2021 IEEE 12th International Symposium on Power Electronics for Distributed Generation Systems (PEDG), Chicago, IL, Jun 28 – Jul 1, 2021. DOI: 10.1109/PEDG51384.2021.9494268.

Bissing, D.; Klein, M.T.; Chinnathambi, R.A.; Selvaraj, D.F.; Ranganathan, P. A Hybrid Regression Model for Day-Ahead Energy Price Forecasting. *IEEE Access* **2019**, *7*, 26833–36842. DOI: 10.1109/ACCESS.2019.2904432.

El Mrabet, Z.; Selvaraj, D.F.; Ranganathan, P. Adaptive Hoeffding Tree with Transfer Learning for Streaming Synchrophasor Data Sets. *In* Proceedings of 2019 IEEE International Conference on Big Data (Big Data), p. 5697–5704.

El-Rewini, Z.; Sadatsharan, K.; Sugunaraj, N.; Selvaraj, D.F.; Plathottam, S.J.; Ranganathan, P. Cybersecurity Attacks in Vehicular Sensors. *IEEE Sensors Journal* **2020**, *20* (22), 13752–13767. DOI: 10.1109/JSEN.2020.3004275.

El-Rewini, Z.; Sadatsharan, K.; Selvaraj, D.F.; Plathottam, S.J.; Ranganathan, P. Cybersecurity Challenges in Vehicular Communications. *Vehicular Communications* **2020**, *23*, 100214

Synergistic Activities

1. Dr. Selvaraj is currently leading the EERC's diverse research portfolio that includes development of modeling schemes and control strategies for smart grid, grid integration of renewable energy systems and electric vehicles (EVs), hardware-in-the-loop testing, and data analytics for smart grid. Her work is supported by DOE and other leading federal and state funding agencies and private industry partners.
2. Dr. Selvaraj is coordinating current efforts for the development of a North Dakota energy resilience plan to address resilience risks associated with widespread and long-term electrical power outages in North Dakota.
3. Dr. Selvaraj was instrumental in the installation resilience study at Grand Forks Air Force Base.
4. Dr. Selvaraj has collaborated with North Dakota power distribution companies to support research on addressing broad grid integration issues with EVs. Through her collaborative approach, UND, along with regional partners, is establishing priorities, direct research, and development activities to address the technical challenges associated with increasing EV utilization across the state.
5. As a merit/panel reviewer, Dr. Selvaraj has reviewed DOE proposals for Artificial Intelligence and Decision Support for Complex Systems & Connected Communities.

BRADLEY G. STEVENS, P.E.
Principal Research Engineer, Civil Engineering
Energy & Environmental Research Center (EERC), University of North Dakota (UND)
15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA
701.777.5293, bstevens@undeerc.org

Education and Training

B.S., Civil Engineering, University of North Dakota, 1989.
Registered Professional Engineer – North Dakota No. PE-4340.

Research and Professional Experience

2022–Present: Principal Research Engineer, Civil Engineering, EERC, UND. Responsibilities include managing a variety of projects and tasks in the areas of oil and gas production and processing, hydrogen production and utilization, electrical grid resiliency, and risk mitigation. Expertise includes soil, groundwater, and industrial process water remediation; process instrumentation and control; wind power generation; hydrogen production; and oil and gas production.

2021–2022: Senior Research Engineer, Civil Engineering Team Lead, EERC, UND.

2011–2021: Senior Research Engineer, EERC, UND. Mr. Stevens' responsibilities included execution of wide-ranging projects under the EERC's Bakken Production Optimization Program, including the study of alternative natural gas use, saline and hydrocarbon soil remediation, and statistical analysis of various oil and gas industry segments.

2005–2011: Research Manager/Engineer, EERC, UND. Mr. Stevens' responsibilities included management of the EERC's Plains Organization for Wind Energy Resources® (POWER®) wind energy program. POWER management duties included strategic planning, fiscal management, program presentation, proposal preparation, and personnel management. In addition, technical duties included installation and setup of wind-monitoring equipment, assessment and analysis of wind resource data, wind turbine production estimates, and theoretical project economics. Other responsibilities included supervision of the design, installation, and operation of an electrolysis-derived hydrogen production and dispensing system.

1998–2005: Research Engineer, Remediation, EERC, UND. Mr. Stevens' responsibilities included the following: management, testing, data analysis, and report preparation for the commercial application of a centrifugal membrane filtration; project management, specification, construction, and demonstration of a freeze–thaw process for the utilization of marginal waters; participation in the Red River Water Management Consortium (RRWMC) as a technical staff member advising RRWMC members regarding pertinent water supply and water quality issues; management and operation of data analysis and report preparation for a sorption and regeneration process for mercury removal from primary and secondary liquid wastes assessment; and data analysis activities related to wind energy.

1992–1998: Project Manager/Engineer, Summit Envirosolutions, Inc., Minneapolis, Minnesota. Mr. Stevens' responsibilities included the following: specification and coordination of the installation of remote data acquisition equipment for municipalities in Minnesota for use as aquifer resource management tools; specification, installation, and maintenance of groundwater flow control and flow measurement equipment in association with a research and development cooperative agreement with NASA involving state-of-the-art methods of remote data acquisition, patented as RealFlow®; design,

installation, and maintenance of permanent and mobile remediation systems in Minnesota, Wisconsin, Nevada, and Arizona, including groundwater pump-and-treat systems, soil vapor extraction systems, and coupled air sparging–soil vapor extraction systems; and management of 20 projects in Minnesota, Wisconsin, and Illinois involving mechanical and electrical control and data retrieval for remedial systems including telemetry-based remedial systems. Other pertinent experience included work with programmable logic controllers and ladder logic programming and training in the use of Intellution FIX DMACS human–machine interface software.

1990–1992: Project Engineer, Delta Environmental Consultants, Inc., St. Paul, Minnesota. Mr. Stevens' responsibilities included the design, permitting, installation, and operation of treatment systems for remediation of contaminated groundwater and soils. Sites ranged from automotive service stations to railroad maintenance yards for projects located in a five-state region. Remediation technologies included subsurface air sparging and soil vapor extraction. Other project responsibilities included data interpretation and permit compliance for 14 remediation systems for a major oil company; supervising excavation of contaminated soils; and permitting and supervising in-place abandonment of a 12,000-gal underground storage tank.

1988–1990: Research/Engineering Technician, EERC, UND. Mr. Stevens' responsibilities included the design, construction, operation and maintenance, data collection and reduction, and formal report preparation for bench-scale treatability programs involving single-stage, two-stage, coupled nitrification–denitrification activated sludge systems, activated carbon adsorption, and ion exchange treatment of coal-processing waters. He maintained and operated the pure oxygen plug flow reactor for the biological treatment of synthetic wastewater. He also assisted in production of a pilot-scale wastewater treatment facility and design and analysis of bench-scale wastewater treatment models.

Patents

Barrett, D.P.; Davis, R.J.; Dustman, J.E.; Gibas, D.R.; Stevens, B.G.L.; Wilson, B.T. Measuring System for Measuring Real-Time Groundwater Data. U.S. Patent 5,553,492, Sept 10, 1996.

Publications

Mr. Stevens has authored or coauthored numerous publications.

CHARLENE R. CROCKER
Senior Research Scientist, Outreach Team Lead
Energy & Environmental Research Center (EERC), University of North Dakota (UND)
15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA
701.777.5018, ccrocker@undeerc.org

Education and Training

B.S., Chemistry, University of North Dakota, 1994; B.A., French, Colby College, Waterville, ME, 1986.

Research and Professional Experience

2002–Present: Senior Research Scientist, Outreach Team Lead, EERC, UND, Grand Forks, ND. Performs managerial and principal investigator duties for projects related to scientific research and public outreach. Outreach work has included development of programs for CO_2 sequestration, water, and fish advisories and development of CO_2 sequestration public outreach materials, water quality education, and water-based geoscience education program and outreach activities for middle and high school students. Research has included projects related to development of sorbents for emission control strategies in fossil fuel-fired energy systems; projects related to environmental management and air quality; collaborations in air and water monitoring, bioassessment tools, market research; proposal and report writing; data analysis; presentation of results; and budget tracking. Serves as the Energy Hawks Internship Program Coordinator and Supervisor, State Energy Research Center at the EERC; develops and implements energy literacy syllabus for multidisciplinary team of graduate and undergraduate students in 10-week internship program; guides development of white papers focused on value-added energy topics for North Dakota.
1994–2002: Research Chemist, EERC, UND. Managed projects relating to environmental management and air quality; collaborated with other scientists on fish consumption survey development, air sampling, coal ash, water purification, and surface decontamination research; wrote proposals and reports, analyzed data, presented results, and tracked budgets; developed air sampling protocols; participated in development of water-based geoscience education program and outreach activities for school children. Performed research on ultratrace elemental analyses on water and energy-related samples and followed quality control procedures.
1993–1994: Research Assistant, EERC, UND. Prepared and analyzed inorganic media for ultratrace elements, including mercury, and prepared reagents and solutions.
1990: Naturalist, Deep Portage Conservation Reserve, Hackensack, MN. Planned and conducted environmental education programs for children and adults; evaluated curriculum.
1988–1990: Sanctuary Manager, Wetlands, Pines & Prairie Audubon Sanctuary, Warren, MN. Planned and conducted environmental education programs, organized chapter meetings, published Sanctuary newsletter, and performed administrative tasks.
1988: Park Ranger/Interpreter, Boston Harbor Islands State Park, Boston, MA. Interpreted natural and human history, developed special programs, and conducted tours and school programs.

Relevant Publications

Crocker, C.R.; Krueger, N.M. Energy and CO_2 Management: Carbon Capture and Storage. Presented at 2023 Lignite Education Seminar, Bismarck, ND, June 13, 2023.

Crocker, C.R.; Leroux, K.M.; Massmann, N.M.; Crossland, J.L.; Manthei, M.M.; Glazewski, K.A.; Daly, D.J.; Hamling, J.A. Public Outreach Package for Carbon Capture and Storage in North Dakota; Task 5 Deliverable D3 for North Dakota Industrial Commission Contract No. R-038-047; EERC, Feb 2020.

Daly, D.J.; Crossland, J.L.; Crocker, C.R. Glazewski, K.A.; Massmann, N.M.; Peck, W.D. North Dakota CarbonSAFE Updated Outreach Plan Phase II, May 2019.

Crocker, C.R.; Daly, D.J. Low-Carbon Energy for North Dakota [documentary short]; Dambach, B.; Olien, M., Site Producers; Prairie Public Broadcasting (PPB): Fargo, ND, and EERC, 2019.

Crocker, C.R.; Daly, D.J. Coal: Engine of Change [DVD]; Dambach, B.; Steadman, E.N., Executive Producers; PPB and EERC, 2018.

Daly, D.J.; Crocker, C.R.; Crossland, J.L.; Massmann, N.M.; Peck, W.D. North Dakota Integrated Carbon Storage Complex Feasibility Study; Deliverable D3 (Outreach Toolkit) for U.S. Department of Energy (DOE) Cooperative Agreement (CA) DE-FE0029488; EERC: Grand Forks, ND, Feb 2018.

Daly, D.J.; Crossland, J.L.; Crocker, C.R.; Gorecki, C.D. Outreach Action Plan; Plains CO_2 Reduction (PCOR) Partnership Phase III Task 2 Deliverable D11 (Update 2) for DOE National Energy Technology Laboratory CA DE-FC26-05NT42592; EERC Publication 2016-EERC-09-02; March.

Daly, D.J.; Crocker, C.R.; Gorecki, C.D. Regionwide Outreach in a Project-Level World – Lessons from the PCOR Partnership. *Energy Procedia* **2017**, *114*, 7224–7236.

Crocker, C.R.; Daly, D.J.; Dambach, B.; Pearson, B.; Anderson, D. A Collaboration among PPB, Classroom Teachers, and the PCOR Partnership to Produce Classroom-Ready CCS Lessons. Presented at the International Workshop on Public Education, Training, and Community Outreach for Carbon Capture, Utilization, and Storage, Decatur, IL, July 30, 2014.

Synergistic Activities

- Outreach Team Lead (Oct 2018–present)/member of ND CarbonSAFE team (Phases II and III) since inception in June 2017, developing and implementing project outreach plan, facilitating Outreach Advisory Board, developing outreach materials, engaging educators and K–12 to postsecondary students on carbon capture and storage (CCS), and providing input and guidance to project timelines, budgets, and objectives.
- Outreach Team Lead (Jan 2019–Nov 2021)/member of RTE Ethanol CCS project since 2017, developing and implementing project outreach plan; developing outreach materials; handling media, talking points, and logistics for county commission appearances; preparing landowner packets and public notices for seismic surveys, environmental sampling events, and research results; overseeing logistics, preparing advertising, and developing materials for community open houses; and providing input and guidance to project timelines, budgets, and objectives.
- Outreach Team member for Regional Carbon Sequestration Partnerships (RCSP) Initiative's PCOR Partnership Program since inception in 2003.
- Associate Producer and Cowriter for seven CCS-related public television documentaries—*Coal: Engine of Change, The Bell Creek Story: CO_2 in Action, Global Energy and Carbon: Tracking Our Footprint, Managing Carbon Dioxide: The Geologic Solution, Out of the Air – Into the Soil: Land Practices That Reduce Atmospheric Carbon Levels, Reducing Our Carbon Footprint: The Role of Markets, Nature in the Balance: CO_2 Sequestration.*
- Codeveloped six outreach plans, 23 outreach posters, numerous fact sheets, general public and educational presentations, and a website focused on aspects of CCS and CCS projects.

APPENDIX B

LETTERS OF SUPPORT

NORTH Dakota | Transportation
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July 19, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

Dear Ms. Selvaraj

This letter is to express North Dakota Department of Transportation's support of the Energy & Environmental Research Center's (EERC) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional Electric Vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

We look forward to working with the EERC team and other project partners. Your point of contact for this project if awarded is Russ Buchholz, who can be reach at (701) 328-2561.

Sincerely,

Ronald J. Henke, PE
Director

DEPARTMENT OF TRANSPORTATION

Minnesota Department of Transportation
Office of Sustainability and Public Health
395 John Ireland Blvd
Mail Stop 245
St. Paul, MN 55055

August 2, 2023

Ms. Daisy Selvaraj, Senior Research Engineer
University of North Dakota -Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj

This letter is to express Minnesota Department of Transportation's (MnDOT) support of the Energy & Environmental Research Center's (EERC) proposal being submitted to the U.S. Department of Energy (DOE).

In 2007, Minnesota passed the bi-partisan Next Generation Energy Act (NGEA), which established goals for the state to reduce greenhouse gas emissions by 15% below 2005 levels by 2015, 30% by 2025, and 80% by 2050. However, the state did not meet the 2015 goal and is not on track to meet our future goals. Transportation became the largest emitter of carbon pollution in the state in 2016. Electrification of transportation is a key strategy to reduce green house gas emissions from transportation. The EERC project will also support the MnDOT Office of Sustainability and Public Health's five focus areas that connect back to agency and statutory transportation and climate goals.

Participation in this project will provide resilience solutions to enhance the implementation of Minnesota's Electric Vehicle Infrastructure Plan as part of the National Electric Vehicle Infrastructure Program. MnDOT can offer learnings from our use of rights of way to support decarbonization of transportation and energy – an effort called NextGen Highways.

MnDOT can provide an in-kind match in the form of staff time to participate in working group meetings, contribute information and data as available, assist in implementation of resilience solutions as fits with our EV Infrastructure plan. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Amber Dallman

Digitally signed by Amber Dallman
Date: 2023.08.02 10:48:58 -05'00'

Amber Dallman
Office of Sustainability and Public Health Director

CC: Beth Kallestad, Principal Sustainability Planner
Jessica Oh, Strategic Partnerships Director
Siri Simons, Sustainability Program Supervisor
Anna Pierce, Interim Sustainability Program Supervisor

Equal Opportunity Employer

MONTANA
Department of Transportation

Malcolm D. Long, Director

2701 Prospect ▪ PO Box 201001
Helena MT 59620-1001

July 19, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

Dear Ms. Selvaraj,

This letter is to express the Montana Department of Transportation's (MDT) support of the Energy & Environmental Research Center's (EERC) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional Electric Vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota. MDT appreciates the collaborative nature of this study, which plans to a working group with key stakeholders from the region that will come together to create recommendations to produce a flexible implementation plan that meets each state's unique needs.

As the agency responsible for managing and improving Montana's transportation system, we recognize the growing importance of EVs. With the rising adoption of EVs, it is crucial to assess and enhance the resiliency of our infrastructure to support transportation across the state. This research aligns closely with our own mission to innovate at all levels and invest in infrastructure that can accommodate the evolving needs of Montana's residents and visitors. Based on our mutual interests, we support the proposed project in the form of providing staff time, roadway data and statewide EV information. We look forward to working with the EERC team and the outcomes and insights that will emerge from this research, which will undoubtedly inform our future transportation planning and resiliency efforts.

Sincerely,

Malcolm D. Long

Malcolm D. Long, Director
Montana Department of Transportation

Rail, Transit and Planning Division
Phone: (406) 444–3423
Fax: (406) 444–7671

Toll–free: (800) 714–7296
TTY: (800) 335–7592
Web Page: www.mdt.mt.gov

July 19, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express the commitment of Minnesota Clean Cities Coalition and North Dakota Clean Cities to the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Our Clean Cities coalitions have been active in developing the region's current EV charging ecosystem and strive to accelerate its growth. We currently lead or support several DOE-funded electric vehicle projects that are active in the region and work with a wide variety of relevant stakeholders in our states. Based on our mutual interests, we are proud to support the proposed project and partner with EERC to develop and implement the resilience plan. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Jon Hunter
Interim Director
North Dakota Clean Cities

Lisa Thurstin
Director
Minnesota Clean Cities Coalition

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July 12, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express North Dakota Department of Commerce's support of the Energy & Environmental Research Center's (EERC) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional Electric Vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Commerce houses the North Dakota State Energy Office and the state energy resiliency plan. Our team is willing to provide resources such as staffing, research, collaboration on community involvement and other time and talent that will help EERC provide this plan for our state. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Joshua Teigen
Commissioner, North Dakota Department of Commerce

1600 E Century Avenue, Suite 6 | P.O. Box 2057 | Bismarck, ND 58502
PHONE: 701-328-5300 | TOLL FREE: 1-866-4DAKOTA | ND RELAY TTY: 1-800-366-6888 | VOICE: 1-800-366-6889 |
NDCommerce.com

NORTH Dakota | Emergency Services
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Aug. 17, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express the N.D. Department of Emergency Services' support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

As the central coordinating agency for emergencies and disasters, planning for disruptions to regional EV charging infrastructure is critical for an effective and intentional emergency response. Weather event-wise, North Dakota is a land of extremes. We know we need to consider the impact on our communities should EV infrastructure be impacted during a disaster. If there is a disruption to energy sources for electric vehicles, we would have citizens unable to travel to safety in the event an evacuation is necessary, or they could become stranded during extreme winter weather events. These scenarios must be planned for so we can identify ways to mitigate these impacts.

The N.D. Department of Emergency Services also manages our state's Critical Infrastructure Program, so we understand the importance of strengthening and maintaining a secure, functioning and resilient energy sector. Based on our mutual interests, we are proud to support the proposed project in the form of regular collaboration. The N.D. Department of Emergency Services will participate in the EERC's working group in which we will attend meetings and provide input for resilience and emergency planning. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Darin Hanson
N.D. Department of Homeland Security Director

NDDES Homeland Security State Radio

Doug Burgum
GOVERNOR

Major General Alan S. Dohrmann
DIRECTOR - DEPARTMENT OF EMERGENCY SERVICES

Darin Hanson
DIRECTOR - DIVISION OF HOMELAND SECURITY

Darin Anderson
DIRECTOR - DIVISION OF STATE RADIO

Ensuring a safe and secure homeland for all North Dakotans

PO Box 5511 | Bismarck, ND 58506-5511 | 701.328.8100 | Fax: 701.328.8181 | Email: nddes@nd.gov | nd.gov/des

August 2, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express the Montana Energy Office at the Montana Department of Environmental Quality's support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

The Montana Energy Office is committed to initiatives and research that help support resilient and reliable transportation electrification. Based on our mutual interests, we are proud to support the proposed project in the form of in-kind cost share. The Montana Energy Office will provide in-kind contribution in the form of staff time over the period of the project. Our staff contributions will include providing data and information related to electric vehicle charging development and installation and participation in the region-wide resilience working group meetings. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Brian P. Bra

METROCOG Fargo-Moorhead Metropolitan Council of Governments

Case Plaza Suite 232 | One 2nd Street N
Fargo, North Dakota 58102-4807
p: 701.532.5100| f: 701.232.5043
e: metrocog@fmmetrocog.org
www.fmmetrocog.org

July 18, 2023

Dr. Daisy Selvaraj, Senior Research Engineer
Energy & Environmental Research Center
University of North Dakota
15 N 23 Street, Stop 9018
Grand Forks, ND 58202-9018

RE: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

Dear Dr. Selvaraj,

This letter from the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) is to express our support of the Energy & Environmental Research Center's (EERC) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional Electric Vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Metro COG and area jurisdictions of the Fargo, ND-MN MSA understand the importance of understanding EV feasibility and its benefits within our transportation network, identifying current and potential barriers to EV adoption, and developing infrastructure-related best practices to meet current and future EV needs in our region. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Ben Griffith, AICP
Executive Director
Fargo-Moorhead Metropolitan Council of Governments

Cass County Electric Cooperative
A Touchstone Energy® Cooperative

August 2, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter expresses Cass County Electric Cooperatives' support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Cass County Electric Cooperative is an electric cooperative serving over 56,000 members in eastern North Dakota. We will support the proposed project through data sharing where applicable. If awarded, we look forward to working with the EERC team and other project partners.

Sincerely,

Jodi Bullinger

Jodi Bullinger
VP Engineering & Operations

Mountrail - Williams Electric Cooperative

Internet: www.mwec.com
Service Area
Toll Free: 1-800-279-2667

PO Box 1346
Williston, ND 58802-1346
(701) 577-3765

PO Box 129
Stanley, ND 58784-0129
(701) 628-2242

PO Box 59
New Town, ND 58763-0059
(701) 627-3550

August 21, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express Mountrail Williams Electric Cooperative's (MWEC) support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

MWEC's service area covers the north half of the Bakken oil field in Mountrail and Williams counties. MWEC is rapidly growing and just reached 750MW peak load. US Hwy 2 goes through MWEC's service area as well. Based on our mutual interests, we are proud to support the proposed project in the form of assistance with engineering support. MWEC will provide system models, analysis, and engineering input. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Scott Iverson
Senior Electrical Engineer
Mountrail-Williams Electric Cooperative

P.O. Box 2747
Fargo, ND 58108

July 28, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota-Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express Xcel Energy's support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Xcel Energy, North Dakota's largest utility began operations in 1908 and is focused on the future of electrification of the transportation industry. Xcel Energy was the first utility to add an electric bucket truck to its fleet. Based on our mutual interests, we are proud to support the proposed project in the form of cost share. Xcel Energy will provide in-kind industry expertise to project working group to develop an EV resilience plan.

We look forward to working with the EERC team and other project partners if awarded

Sincerely,

Tony Grindberg

Tony Grindberg
Xcel Energy
North Dakota Principal Manager
2302 Great Northern Drive
Fargo, ND 58102

ZEF ENERGY

August 14, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to
DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express ZEF Energy's support of the Energy & Environmental Research Center's (EERC's) EV Infrastructure Resiliency Plan proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota. There are considerable grid resources needed to build out all of the EV charging infrastructure needed to support EV driers traveling in this legion. Further, resiliency planning will be key when planning for this infrastructure.

As an EV charging solutions provider (an EVSE manufacturer and network operator), ZEF sees the importance of this work. We specialize in working in rural areas and with mid and small sized utilities and communities. We see the importance of good planning so that investment decisions are well informed, especially with significant funding opportunities coming up over the next 5-7 years. Based on our mutual interests, we are proud to support the proposed project in the form of cost share. ZEF Energy will provide technical input along the way. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Megan D. Hoye

Megan Hoye
Chief Development Officer

CONNEXUS
CONNEXUS CAPITAL, LLC

August 2, 2023

Ms. Daisy Selvaraj
Senior Research Engineer, University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

Dear Ms. Selvaraj,

On behalf of Connexus Capital LLC, I submit this letter to express our support of the Energy & Environmental Research Center's ("EERC") subject proposal being submitted to the U.S. Department of Energy ("DOE").

The proposed EERC project will develop and implement a regional Electric Vehicle ("EV") infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

CONNEXUS is a black-owned and operated strategic advisory services firm that specializes in operations and project administration — with a particular focus on infrastructure-level physical & technological initiatives. The company has served clients in renewable energy, law, education, not-for-profit, and financial services. Partners have designed renewable-energy related solutions for nation-state actors, including transportation and energy grid planning programs for the State of California South Coast Air Quality Management District.

Based on our mutual interests, we are proud to support the proposed project in the form of cost-share. CONNEXUS will provide (i) its network, and (ii) the time and expertise of relevant members of its team as needed or otherwise requested to help fulfill project objectives.

We look forward to working with the EERC team and other project partners if awarded. Please feel free to contact me directly at william@connexus.io if I may be of further service.

Most sincerely,

William T. Whitaker
Founder & CEO

August 21, 2023

Ms. Daisy Selvaraj
Senior Research Engineer, University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

Dear Ms. Selvaraj,

On behalf of SAGE Development Authority ("SAGE"), I submit this letter to express our support of the Energy & Environmental Research Center's ("EERC") subject proposal being submitted to the U.S. Department of Energy ("DOE"). The proposed EERC project will develop and implement a regional Electric Vehicle ("EV") infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure and provide solutions to ensure the continuity of operations and services of EV infrastructure and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

SAGE is a 100% Native-led organization, is dedicated to community development, institution-building, and self-determination for the Standing Rock Sioux Tribe. SAGE Development Authority exists to ensure energy independence, protect the environment, and promote economic growth in the region, for the Tribe. A federally chartered Section 17 Corporation created by the Standing Rock Sioux Tribe, SAGE acts as a Public Power Authority (PPA) that will control and operate all the energy production assets within the reservation. As an organization, SAGE institutionalizes Standing Rock's involvement in renewable energy projects, facilitates agreements with third-party entities, and holds the Standing Rock Sioux Tribe's equity interest.

Based on our mutual interests, we are proud to support the proposed project in the form of cost-share derived from the time and expertise of its team as needed to fulfill project objectives. SAGE will also engage its network as needed in service of the project's fact-finding, research, and solutions development efforts.

We are a committed partner to expanding the use of electric vehicles and charging infrastructure in the region. We look forward to working with the EERC team and other project partners if awarded. Thank you for leading this important project. Please contact me via email at joseph@sagesrst.com, at the office (701-854-4766), or on my cell (701-425-3776) if I may be further of service.

Sincerely,

Tatanka Wanjila – Joseph McNeil Jr. | General Manager

SAGE Development Authority

NATIVE SUN COMMUNITY POWER DEVELOPMENT

July 31, 2023

Ms. Daisy Selvaraj
Senior Research Engineer
University of North Dakota
Energy & Environmental Research Center
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Ms. Selvaraj:

Subject: Energy & Environmental Research Center Proposal in Response to DOE-NETL-EERE-DOT-JOINT-OFFICE-DE-FOA-0002881

This letter is to express Native Sun's support of the Energy & Environmental Research Center's (EERC's) subject proposal being submitted to the U.S. Department of Energy (DOE).

The proposed EERC project will develop and implement a regional electric vehicle (EV) infrastructure resilience plan that can assess the current and future threats and risks to regional EV charging infrastructure, provide solutions to ensure the continuity of operations and services of EV infrastructure, and maximize benefits to all EV users in North Dakota, South Dakota, Montana, and Minnesota.

Native Sun is a native-led nonprofit that promotes energy efficiency, renewable energy and an equitable energy transition through education, workforce training and demonstration. We are building a dynamic clean energy future that works for all. Based on our mutual interests, we are proud to support the proposed project in the form of cost share. Native Sun will provide expertise in working with Tribal communities in planning for EV infrastructure. We look forward to working with the EERC team and other project partners if awarded.

Sincerely,

Robert Blake
Executive Director

APPENDIX C

BUDGET NOTES

BUDGET NOTES

ENERGY & ENVIRONMENTAL RESEARCH CENTER (EERC)

BACKGROUND

The EERC is an independently organized multidisciplinary research center within the University of North Dakota (UND). The EERC is funded through federal and nonfederal grants, contracts, and other agreements. Although the EERC is not affiliated with any one academic department, university faculty may participate in a project, depending on the scope of work and expertise required to perform the project.

INTELLECTUAL PROPERTY

The applicable federal intellectual property (IP) regulations will govern any resulting research agreement(s). In the event that IP with the potential to generate revenue to which the EERC is entitled is developed under this project, such IP, including rights, title, interest, and obligations, may be transferred to the EERC Foundation, a separate legal entity.

BUDGET INFORMATION

The proposed work will be done on a cost-reimbursable basis. The distribution of costs between budget categories (labor, travel, supplies, equipment, etc.) and among funding sources of the same scope of work is for planning purposes only. The project manager may incur and allocate allowable project costs among the funding sources for this scope of work in accordance with Office of Management and Budget (OMB) Uniform Guidance 2 CFR 200.

Escalation of labor and EERC recharge center rates is incorporated into the budget when a project's duration extends beyond the university's current fiscal year (July 1 – June 30). Escalation is calculated by prorating an average annual increase over the anticipated life of the project.

The cost of this project is based on a specific start date indicated at the top of the EERC budget. Any delay in the start of this project may result in a budget increase. Budget category descriptions presented below are for informational purposes; some categories may not appear in the budget.

Salaries: Salary estimates are based on the scope of work and prior experience on projects of similar scope. The labor rate used for specifically identified personnel is the current hourly rate for that individual. The labor category rate is the average rate of a personnel group with similar job descriptions. Salary costs incurred are based on direct hourly effort on the project. Faculty who work on this project may be paid an amount over the normal base salary, creating an overload which is subject to limitation in accordance with university policy. As noted in the UND EERC Cost Accounting Standards Board Disclosure Statement, administrative salary and support costs which can be specifically identified to the project are direct-charged and not charged as facilities and administrative (F&A) costs. Costs for general support services such as contracts and IP, accounting, human resources, procurement, and clerical support of these functions are charged as F&A costs.

Fringe Benefits: Fringe benefits consist of two components which are budgeted as a percentage of direct labor. The first component is a fixed percentage approved annually by the UND cognizant audit

agency, the Department of Health and Human Services. This portion of the rate covers vacation, holiday, and sick leave (VSL) and is applied to direct labor for permanent staff eligible for VSL benefits. Only the actual approved rate will be charged to the project. The second component is estimated on the basis of historical data and is charged as actual expenses for items such as health, life, and unemployment insurance; social security; worker's compensation; and UND retirement contributions.

Travel: Travel may include site visits, fieldwork, meetings, and conferences. Travel costs are estimated and paid in accordance with OMB Uniform Guidance 2 CFR 200, Section 474, and UND travel policies, which can be found at https://campus.und.edu/finance/procurement-and-payment-services/travel/travel.html (Policies & Procedures, A–Z Policy Index, Travel). Daily meal rates are based on U.S. General Services Administration (GSA) rates unless further limited by UND travel policies; other estimates such as airfare, lodging, ground transportation, and miscellaneous costs are based on a combination of historical costs and current market prices. Miscellaneous travel costs may include parking fees, Internet charges, long-distance phone, copies, faxes, shipping, and postage.

Supplies: Supplies include items and materials that are necessary for the research project and can be directly identified to the project. Supply and material estimates are based on prior experience with similar projects. Examples of supply items are chemicals, gases, glassware, nuts, bolts, piping, data storage, paper, memory, software, toner cartridges, maps, sample containers, minor equipment (value less than $5000), signage, safety items, subscriptions, books, and reference materials. General purpose office supplies (pencils, pens, paper clips, staples, Post-it notes, etc.) are included in the F&A cost.

Subcontractor – Matthew Stolz: Subcontractors are budgeted based on project needs. Mr. Stolz will handle the technical consulting related to electric utility operation and regulation as it relates to electric vehicle (EV) infrastructure. Cost is based on conversations with vendor for Tasks 1.3/1.4 and 2.3/2.4. Please see the scope of work and background/qualifications for additional details.

Communications: Telephone, cell phone, and fax line charges are included in the F&A cost; however, direct project costs may include line charges at remote locations, long-distance telephone charges, postage, and other data or document transportation costs that can be directly identified to a project. Estimated costs are based on prior experience with similar projects.

Printing and Duplicating: Page rates are established annually by the university's duplicating center. Printing and duplicating costs are allocated to the appropriate funding source. Estimated costs are based on prior experience with similar projects.

Food: Expenditures for hosting listening sessions, focus groups, and engagement trips with community stakeholders where the primary purpose is dissemination of technical information may include the cost of food. EERC employees in attendance will not receive per diem reimbursement for meals that are paid by project funds. The estimated cost is based on the number and location of project partner meetings.

Rents and Leases – Venue Rental: Venue rental for listening sessions, focus groups, and engagement trips with community stakeholders. Two rentals at $600.

Honorarium: Nominal compensation for stakeholders to participate in listening sessions and focus groups. Based on 10 sessions with four people at $50 per.

Operating Fees: Operating fees generally include EERC recharge centers, outside laboratories, and freight.

EERC recharge center rates are established annually and approved by the university.

Document production services recharge fees are based on an hourly rate for production of such items as report figures, posters, and/or images for presentations, maps, schematics, website design, brochures, and photographs. The estimated cost is based on prior experience with similar projects.

Technical software fees are for Smartsheet software, which is to be used for tracking and reporting on project specific deliverables and milestones.

Engineering services recharge fees cover specific expenses related to retaining qualified and certified design and engineering personnel. The rate includes training to enhance skill sets and maintain certifications using Webinars and workshops. The rate also includes specialized safety training and related physicals. The estimated cost is based on the number of hours budgeted for this group of individuals.

Facilities and Administrative Cost: The F&A rate proposed herein is approved by the U.S. Department of Health and Human Services and is applied to modified total direct costs (MTDC). MTDC is defined as total direct costs less individual capital expenditures, such as equipment or software costing $5000 or more with a useful life of greater than 1 year as well as subawards in excess of the first $25,000 for each award.

APPENDIX D

EERC PROJECTS FUNDED BY NDIC IN THE LAST 5 YEARS

EERC PROJECTS FUNDED BY NDIC IN THE LAST 5 YEARS

Project Name	Start Date	End Date	Total Contracted
Bakken Production Optimization Program 2.0	11/01/16	05/31/20	$6,000,000
Initial Engineering, Testing, and Design of a Commercial-Scale CO_2 Capture System	09/01/17	12/31/19	$3,200,000
FERR 1.3 – Integrated Carbon Capture and Storage for North Dakota Ethanol Production	11/01/17	07/31/18	$345,000
iPIPE: The intelligent Pipeline Integrity Program	04/01/18	12/31/23	$2,600,000
Economic Extraction and Recovery of REES and Production of Clean Value-Added Products from Low-Rank Coal Fly Ash	06/16/18	02/15/20	$30,000
Low-Pressure Electrolytic Ammonia Production	06/16/18	06/30/22	$437,000
FERR 1.3 – Integrated Carbon Capture and Storage for North Dakota Ethanol Production	12/01/18	05/31/20	$500,000
State Energy Research Center	07/01/19	06/30/27	$17,500,000
Underground Storage of Produced Natural Gas – Conceptual Evaluation and Pilot Project(s)	06/01/19	06/30/23	$3,500,000
Assessment of Bakken and Three Forks Natural Gas Compositions	11/01/19	06/19/20	$300,650
Improving EOR Performance Through Data Analytics and Next-Generation Controllable Completions	01/27/20	09/30/24	$500,000
Wastewater Recycling Using a Hygroscopic Cooling System	01/31/20	09/30/22	$100,000
PCOR Partnership Initiative to Accelerate CCUS Deployment	02/01/20	09/30/24	$2,000,000
PCOR Partnership Initiative to Accelerate CCUS Deployment	02/01/20	09/30/24	$2,000,000
FERR 3.2 – Produced Water Management Through Geologic Homogenization, Conditioning, and Reuse	02/01/20	01/31/22	$300,000
Bakken Production Optimization Program 3.0	05/01/20	04/30/23	$6,000,000
EERC Technical Support for RTE CCS Activities – November 1, 2019	06/01/20	11/30/21	$500,000
Flue Gas Characterization and Testing	07/01/20	11/30/21	$3,741,450
Laboratory-Scale Coal-Derived Graphene Process	09/01/20	04/30/23	$162,500
Hydrogen Energy Development for North Dakota	07/01/21	06/30/23	$500,000
Ammonia-Based Energy Storage Technology	04/01/21	03/31/23	$101,390
Field Study to Determine the Feasibility of Developing Salt Caverns for Hydrocarbon Storage in Western North Dakota	07/01/21	06/30/23	$11,900,000
Williston Basin CORE-CM Initiative	02/01/22	05/31/23	$750,000
Front-End Engineering and Design for CO_2 Capture at Coal Creek Station	02/01/22	08/31/23	$7,000,000
Unitized Legacy Oil Fields: Prototypes for Revitalizing Conventional Oil Fields in North Dakota	07/01/21	06/30/24	$3,000,000
iPIPE 2.0: The intelligent Pipeline Integrity Program	01/01/22	12/31/23	$400,000
Advanced Processing of Coal and Waste Coal to Produce Graphite for Fast-Charging Lithium-Ion Battery	02/01/22	01/31/25	$500,000
Liberty H_2 Hub Front-End Engineering and Design	11/01/22	10/31/24	$10,000,000

Continued . . .

EERC PROJECTS FUNDED BY NDIC IN THE LAST 5 YEARS (continued)

Redundancy Study for CO_2 Capture at Coal Creek Station	5/26/2023	3/31/2024	$837,313
Coal Creek Carbon Capture: Geologic CO_2 Storage Complex Development	7/1/2023	5/31/2024	$6,119,690
BPOP 4.0 – Bakken Production Optimization Program 4.0	7/28/2023	10/31/2025	$6,000,000
Prairie Horizon Carbon Management Hub	11/1/2023	10/31/2025	$100,000
Rare-Earth Minerals Study	2/1/2024	4/30/2025	$1,500,000

APPENDIX E

REFERENCES

REFERENCES

1. North Dakota Electric Vehicle (EV) Infrastructure Plan: https://www.dot.nd.gov/construction-and-planning/transportation-plans-programs/north-dakota-electric-vehicle-ev#:~:text=North%20Dakota%20will%20receive%20approximately,charging%20experience%20for%20all%20users (accessed February 2024).

2. All Hazards Analysis (AHA), A Dynamic Approach to Critical Infrastructure Threats: https://inl.gov/ics-aha/ (accessed February 2024).

3. Electric Vehicle Charging Station Locations: https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC (accessed February 2024).

4. U.S. State Population by Rank: https://www.infoplease.com/us/states/state-population-by-rank (accessed February 2024).

INDUSTRIAL COMMISSION OF NORTH DAKOTA
RENEWABLE ENERGY PROGRAM

TECHNICAL REVIEWERS' RATING SUMMARY

R-053-B
REGIONAL ELECTRIC VEHICLE INFRASTRUCTURE RESILIENCE (REVIR) PLAN

Principal Investigator: Dr. Daisy Selvaraj

Request for $375,000 Total Project Costs $1,875,000

TECHNICAL REVIEWERS' RATING SUMMARY
R-053-B
REGIONAL ELECTRIC VEHICLE INFRASTRUCTURE RESILIENCE (REVIR) PLAN
Principal Investigator: Dr. Daisy Selvaraj
Request for $375,000 Total Project Costs $1,875,000

Rating Category	Weighting Factor	Technical Reviewer 1B	Technical Reviewer 3B	Average Weighted Score
1. Objectives	9	4	3	31.50
2. Achievability	9	5	5	45.00
3. Methodology	7	4	3	24.50
4. Contribution	7	5	2	24.50
5. Awareness	5	4	4	20.00
6. Background	5	5	4	22.50
7. Project Management	2	3	3	6.00
8. Equipment Purchase	2	5	5	10.00
9. Facilities	2	5	5	10.00
10. Budget	2	4	4	8.00
Average Weighted Score		223	181	**202.00**
Maximum Weighted Score				250.00

1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.

Reviewer 1B (Rating 4)

As the abstract states, this project has the potential to "foster EV sector growth, catalyze investment to diversify North Dakota's economy, expand use of renewable energy resources, and create renewable energy jobs, wealth, and tax revenues" – all of which is in line with North Dakota Industrial Commission/Renewable Energy Council goals.

The proposal clearly outlines the EV infrastructure resilience challenges the project aims to address, including harsh winter climate, extreme weather events, limited rural distribution grid infrastructure, lack of charging infrastructure, and low EV adoption.

It would have been nice to more explicitly outline the connections between EV charging, grid resilience, and economic development opportunities in line with ND's goals.

Reviewer 3B (Rating 3)
The application makes a clear connection between the resiliency/reliability of the EV charging network and the goals of the NDIC/REC. The connection appears to be public education through learning sessions and public service employee education/awareness of grid/service risks and various mitigation strategies. The application assumes the connection between EV usage and renewable energy usage which is marginal at a best-case scenario.

2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.

Reviewer 1B (Rating 5)
The project has already been selected for award by the U.S. Department of Energy.

In addition, the list of partners that are already committed to participating in the working group is extensive and impressive. With this upfront buy-in from stakeholders, I am confident in the project's ability to achieve its objectives within the proposed time and budget.

Reviewer 3B (Rating 5)
The stated goals are certainly achievable within the budget and timeframe.

3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.

Reviewer 1B (Rating 4)
The methodology is clear and well thought-out.

I would have liked to see more information about what sort of outreach they plan to conduct and how they will prioritize participants for the working group.

Reviewer 3B (Rating 3)
Using the Idaho National Lab risk assessment methodology is excellent and provides a standard to identify and develop mitigation for associated risks. However, there are significant gaps in the working group members from a system.

Cass County REC is the only REC on the EV corridor
Xcel is the only Generation entity
Where are the Workforce training and Labor resources representatives
South Dakota DOT representative

The grant states that members may be added, I would have liked to have seen a list of members the RWG are actively pursuing.

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Renewable Energy Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.

Reviewer 1B (Rating 5)

According to the goals of the North Dakota Industrial Commission/Renewable Energy Council that I was able to find online, this project will directly support these goals in an extremely significant way.

I was particularly interested to learn that "over half of the electricity generated in North Dakota goes to out-of-state customers, most to Minnesota." This underscores the importance of this regional collaboration.

Reviewer 3B (Rating 2)

The risk assessment will provide a small technical contribution to the NDIC/REC goals by increasing public awareness of the risks and rewards of EV infrastructure in the alt. fuel corridors. It is limited by the number of individuals and groups the outreach portion of the project. The reasoning of the small contribution is that many of the mitigation solutions exist for general grid reliability and equipment availability and need to be in a coherent package.

5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1B (Rating 4)

Very little other research/literature was referenced in the proposal, but it's clear from the PI's resume that they are exceptionally aware of other research activity in this field.

Reviewer 3B (Rating 4)

The PI and team are engaged in relevant industry and research activities to lead this study.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1B (Rating 5)

The PI has significant experience with energy infrastructure risk and resilience assessments, distribution system planning and analysis, load flow and hosting capacity analysis, studies on distributed energy resources (DER) impacts, and production cost and energy market simulations, all of which will be critical for this project.

The PI and assistant have already developed a North Dakota grid resilience plan.

Reviewer 3B (Rating 4)

The team appear to have the experience and expertise necessary to complete the assessment, interact with various stakeholder entities, and conduct information sessions.

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 1B (Rating 3)

There is a proposed project schedule on page 14, but no milestones are included. The budget breakdown on page 15 is not broken down by task, and no concrete communication plan is provided.

Reviewer 3B (Rating 3)

There is a schedule for each task, however there is no spend schedule/financial plan or specific deliverable date list. Communication between parties in indirectly address in the application.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 1B (Rating 5)

No equipment will be purchased.

Reviewer 3B (Rating 5)

N/A

9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 1B (Rating 5)

No equipment will be purchased for the project.

Reviewer 3B (Rating 5)

The EERC is well equipped to perform the grant activities.

10. The proposed budget "value"[1] relative to the outlined work and the financial commitment from other sources[2] is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 1B (Rating 4)

The project has already received 80 percent of overall project funding from the Joint Office of Energy and Transportation (JOET) within the U.S. Department of Energy (DOE).

North Dakota is being asked to contribute only 20% of overall project funds.

Reviewer 3B (Rating 4)

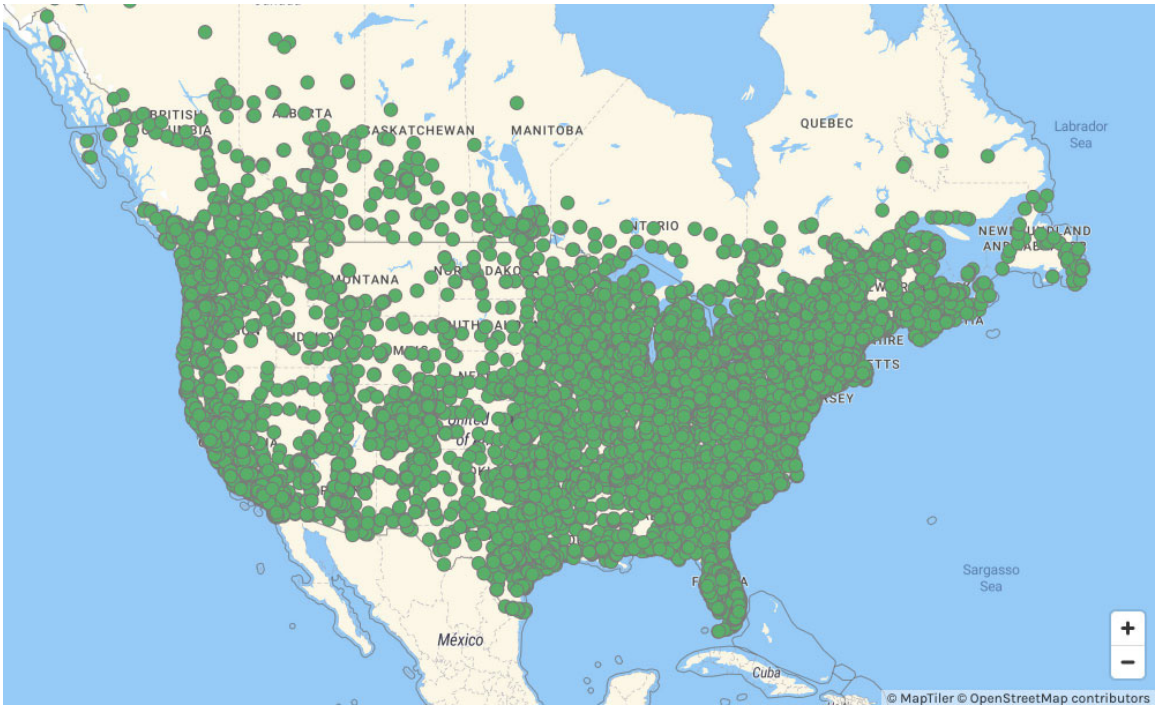
Addressing the risks and mitigation strategies for placing high power EV chargers in the wild (remote areas accessible to the public) has a value which can be utilized in a number of other important industries.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 1B

When one looks at the current placement of EV chargers across the U.S. (see screenshot below from the DOE Alternative Fuels Data Center), this region is particularly underserved



Reviewer 3B

The project is a good way to document and inform the various stakeholders of the issues with remote EV infrastructure. The risk mitigation package (REVIR plan) is needed to make various groups aware of the challenges of the other entities involved. I would like to see greater involvement beyond ND an MN. The challenges/risks are different between in frequency and magnitude between the states, even within a state.

Funding: Recommended

RENEWABLE ENERGY COUNCIL

Ballot for April 15th, 2024

Grant Round 53 Applications

Name:

RECOMMEND FUNDING	DO *NOT* FUND	
		R-053-A – Twin Solar Complex; Submitted by Innovative Renewables, LLC; Total Project Costs: $756,370; **Amount Requested: $378,185** Contingencies: •
		R-053-B – Regional Electric Vehicle Infrastructure Resilience (REVIR) Plan; Submitted by EERC, UND; Total Project Costs: $1,875,000; **Amount Requested: $375,000** Contingencies: •