Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID: 159-E**

Community-Scale Energy Storage Guide for Renewable Energy

Category: E. Air Quality, Climate Change, and Renewable Energy

Total Project Budget: $ 625,478

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

Create user-friendly, research-based energy storage guide and decision tools (print and web-based) for community-scale sites with renewable energy and do three geographically dispersed battery storage demonstration projects, through broad stakeholder-expert engagement.

Name: Ellen Anderson

Sponsoring Organization: U of MN

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

The graphic shows some existing energy storage projects (and a research project in Northern Minnesota) on a map of Minnesota

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Community-Scale Energy Storage Guide for Renewable Energy

I. PROJECT STATEMENT

More and more cities, campuses, nonprofit entities, and businesses across Minnesota are using wind and solar technology to produce cleaner energy. But to reach high levels of renewable energy, significantly reduce their emissions, and achieve energy independence, they will need to include energy storage in their energy systems. We propose a Community-Scale Energy Storage Guide and 3 exemplar Demonstration Projects to provide the tools and knowledge for community-scale energy customers to choose the best energy storage solutions. Activities include: 1) create a research-based, user-friendly print and web-based guide to energy storage; 2) select 3 representative small-scale microgrids or local energy customers and provide them with a battery energy storage system; 3) assess results, and share the results broadly through public engagement, site tours, and dissemination of web and print knowledge tools. Demonstration Project criteria: geographically dispersed (1-northern MN, 1-central/southern MN, 1-metro), on-site renewable energy, customer-controlled energy system (examples: hospital, municipal buildings, college campus); project funds will cover the cost of a battery storage system up to 50 kW. The overall goal is to expand community-based, locally-produced renewable energy, mitigate climate change, and reduce air emissions to improve the environment, all under LCCMR funding priority E.

Energy storage is a linchpin to a more innovative, clean, and efficient energy system, but its many uses and technology choices are complicated. Only a few, mostly large scale projects exist in Minnesota. Community-scale energy users need the knowledge tools created by this project to achieve important outcomes: 1) community-scale renewable energy projects will be more productive and valuable, 2) community-scale customers will understand how to use storage to reduce their energy costs and emissions (for example, by reducing peak demand), and 3) community-scale customers with high-ambition goals for carbon-neutrality or 100% renewable energy will have a crucial tool to achieve them. The Energy Transition Lab's statewide Energy Storage Collaborative includes approximately 100 stakeholders from the public, private, nonprofit, and community sectors along with University experts. ETL and the Collaborative will provide expert advisors, host the web-based tool, and broadly disseminate results.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Community Scale Energy Storage Guide Preparation, Testing, & Publication **Budget: $159,345.25**

Develop the Minnesota Energy Storage Guidebook, a plain English, user-friendly print and web-based information resource, including a decision-making flow chart tool for selecting the most appropriate, cost-effective technologies for energy users' proposed goals. The Beta version will be evaluated by an expert advisory group and tested by users. The final version will be broadly disseminated and hosted on ETL's website.

Outcome	Completion Date
1. Research completed on technology, economics, value streams of storage	Dec. 31, 2018
2. Beta version of guidebook with print and basic web version of user-friendly information resources and decision flow process graphics completed	March 31, 2019
3. Expert advisory group convened; expert review comments incorporated into guidebook	May 31, 2019
4. Representative energy customers focus groups convened; guidebook information and decision tools evaluated	Oct. 31, 2019
5. Print and Web-based guide and decision flow tools revised and published/online	Jan. 15, 2020

Activity 2: Community Scale Energy Storage & Renewable Energy Demonstrations

Develop protocol for characteristics of 3 Exemplar Demonstration Projects, which will be examples of representative community scale energy customers with on-site renewable energy resources, control over their "mini-grid" energy system, and widely replicable. The Guidebook's tool will help pick the appropriate technology type and applications, and technical assistance will be provided for proper installation and operation.

Budget: $466,132.75

Outcome	Completion Date
1. Potential sites for 3 Exemplar Demonstration Projects have been evaluated via research, site visits	Dec. 31, 2018
2. Exemplar Demonstration Projects hosts selected	April 30, 2019
3. Project team has met with Exemplar Demonstration Projects hosts, presented guidebook and decision tools information	July 31, 2019
4. Post-Doctoral fellow and Advisory Group provides technical support for installation of storage system and controls.	May 31, 2020
5. Field Day site tours of 3 projects, presentations by customer and experts, completed	Feb. 28, 2021
6. Demonstration projects assessment report completed	Feb. 18, 2021

III. PROJECT STRATEGY

A. Project Team/Partners

A. Project Team/Partners

Energy Transition Lab Executive Director Ellen Anderson will lead the project. Ellen leads the Minnesota Energy Storage Alliance, which includes University experts Dr. Massoud Amin, Prof. Hari Osofsky; experts from electric utilities Xcel Energy, Minnesota Power, and Great River Energy, wind and solar energy industry experts, NGO experts Fresh Energy and Great Plains Institute, and many other industry experts. An Advisory Group will be formed from this group to advise the project team and project hosts.

Project partners receiving Funds:

- Ellen Anderson $99,140: Project lead, staff supervision, engagement of project partners and advisors
- UMN Graduate Research Assistant $124,608: Research, writing, web development, logistics
- Post-Doc Research Fellow $70,140: Technical support, written assessment of demonstration projects
- Exemplar Demonstration Project Hosts $300,000: Install energy storage project, share learning

Project partners not receiving Funds:

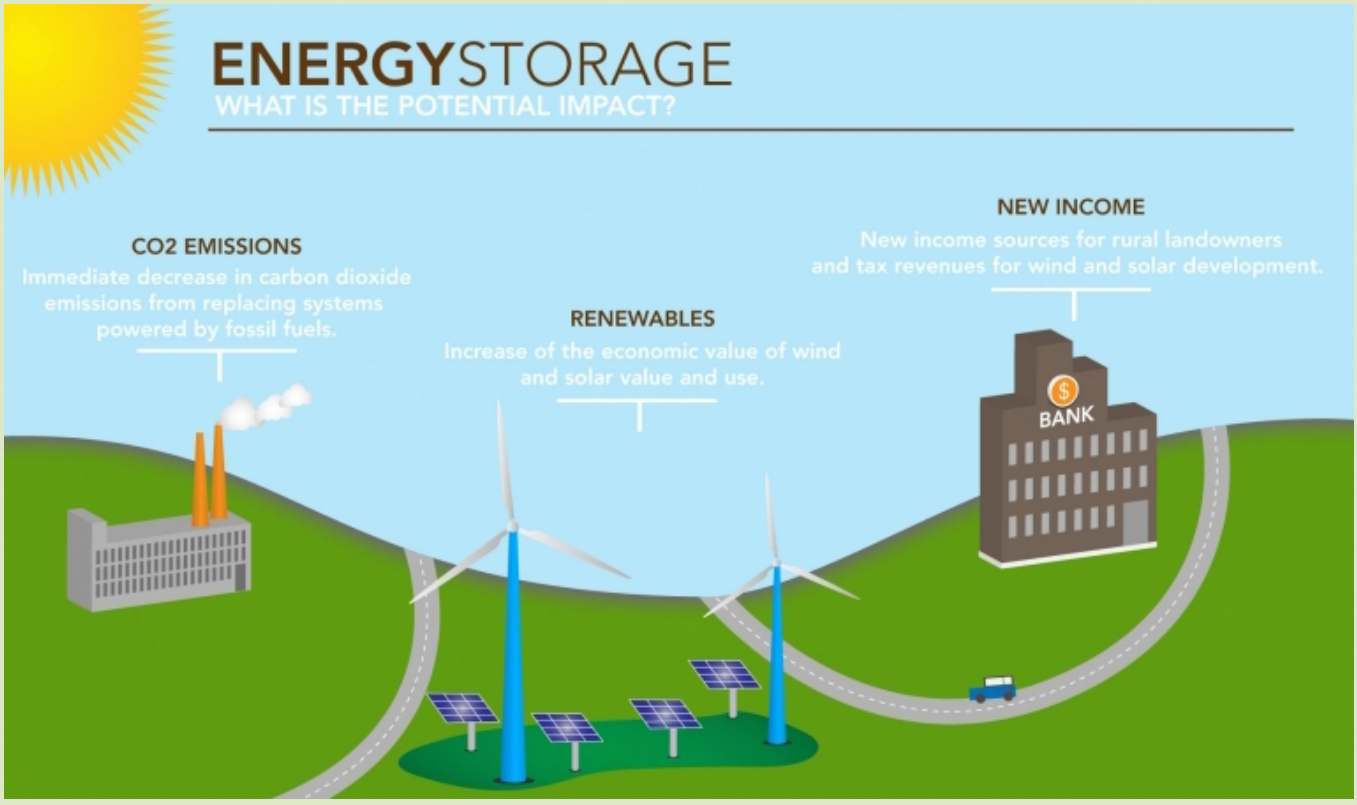
- Advisory Group stakeholder experts

B. Project Impact and Long-Term Strategy

Our tangible outcomes--the Energy Storage Guidebook, 3 Exemplar Demonstration Projects, public "Field Days"--will be supplemented by the Minnesota Energy Storage Collaborative's work to accelerate understanding and deployment of energy storage in Minnesota for a cleaner and more efficient grid. We will highlight this project at ETL's annual Energy Storage Summit, host knowledge tools on our website, and share it with stakeholders and our many partners from across the Midwest. The experience and knowledge gained can be a replicable model for small-scale microgrids and community-based energy customers across our region, and inspire ongoing dissemination, implementation and further research. Our state's transition to clean energy depends upon broad adoption of local renewable energy resources, but small-scale energy users often lack the resources or knowledge to vet complex technology choices. Once we can demonstrate the viability of these projects, project financing becomes easier. [The Energy Transition Lab is supported by the University of Minnesota's Office of the Vice President for Research, the Institute on the Environment, and the Law School.]

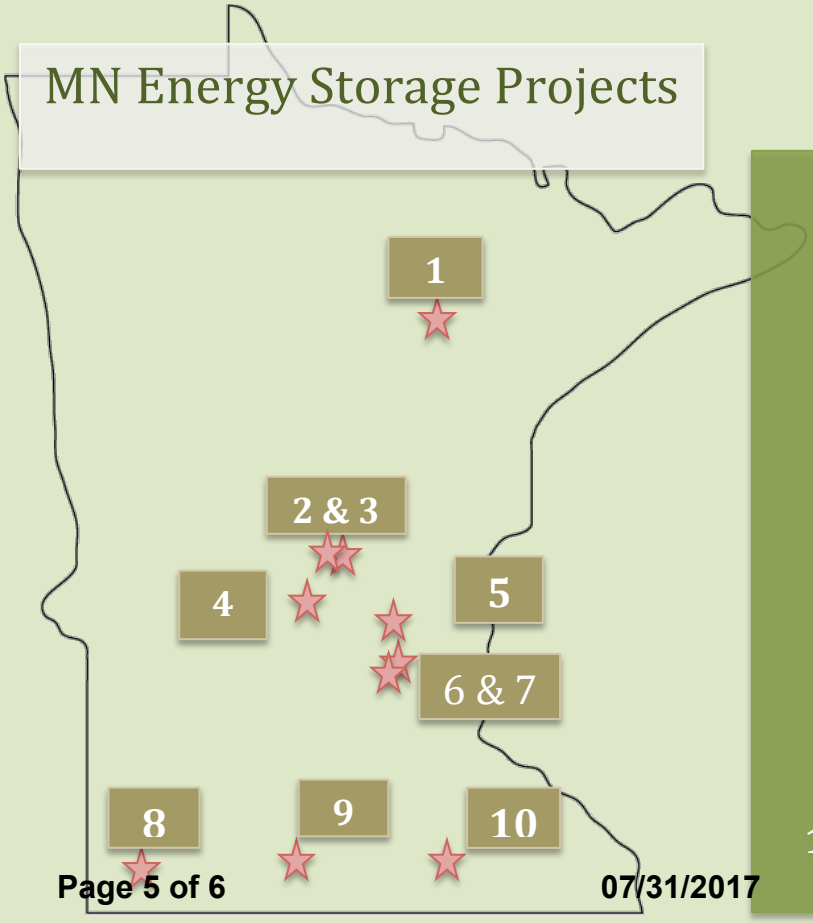
2018 Detailed Project Budget		
Project Title: Community-Scale Energy Storage Guide for Clean Energy		
TOTAL ENRTF REQUEST BUDGET 3 YEARS		
BUDGET ITEM:	**AMOUNT**	
Personnel:		
Ellen Anderson, Project Manager (76% salary, 24% fringe); 30% FTE in year 1, 25% FTE in year 2, 20% FTE in year 3	$99,705.00	
Graduate Research Assistant (60% salary, 40% fringe); 50% FTE in year 1, 50% FTE in year 2, 25% FTE in year 3	$124,608	
Post-Doc Research Fellow (86% salary, 14% fringe); 100% FTE in year 2 only	$70,140	
Equipment/Supplies:		
3 Energy Storage Systems for Demonstration Projects (maximum allowed for each project is $100,000)	$300,000	
Office supplies and services, includes printing/copying Guidebook (drafts + final); materials for meetings & Field Days	$3,040	
Technical Services		
Creation of user-friendly web-based guide for community-scale energy storage, to be hosted by Energy Transition Lab	$10,000	
Travel		
In-state travel to potential and actual demonstration sites (mileage)	$6,540	
Meals		
Meals for travel days, for host site meetings and focus group, advisory group, and field days	$7,895	
Lodging		
Overnight for travel by project team to demonstration host sites, and for outstate advisory group members	$3,550	
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST	**625,478**	
V. OTHER FUNDS		
SOURCE OF FUNDS		**Status**
Serendipity Grant, University of Minnesota, for energy storage research and related work	$23,000	Secured
McKnight Foundation, for energy storage statewide stakeholder engagement and roadmapping	$55,000	Secured

Community-Scale Energy Storage Guide for Clean Energy



Source: energy.gov

MN Energy Storage Projects



1. Mesabi Range Pumped Hydro (PHES)
2. Wright-Henn. Solar + Storage
3. National Rural Electric Co-Op - Rockford
4. National Rural Electric Co-Op - Litchfield
5. National Rural Electric Co-Op - Shakopee
6. National Rural Electric Co-Op - Jordan
7. National Rural Electric Co-Op
8. XCEL Wind to Battery
9. National Rural Electric Co-Op – Jackson
10. Austin Utilities ES Pilot

Ellen Anderson, Project Manager & Energy Transition Lab

Ellen Anderson is Executive Director of the University of Minnesota's Energy Transition Lab (ETL). (www.energytransition.umn.edu) The Lab is supported by the University of Minnesota's Institute on the Environment, the Office of the Vice President for Research, and the Law School. It leverages University expertise in law, policy, and many other disciplines, in partnership with the public, private, community, and nonprofit sectors, to help solve our biggest energy challenges for the future. Current ETL projects include energy storage, energy future planning in Duluth and other cities, and solar energy adoption at the University of Minnesota. Anderson leads the Minnesota Energy Storage Collaborative, a statewide stakeholder organization focused on energy storage research, demonstrations, and law, policy, and markets related to energy storage. ETL hosted the first-ever Minnesota Energy Storage Summit in 2015, which will be an annual event. Anderson and her research assistants created a user-friendly "Energy Storage 101" booklet for the Summit. Anderson's energy storage work brings together University and stakeholder experts.

In addition to her Executive Director role, Anderson is also Adjunct Associate Professor with the U of MN Law School and the Sustainability Studies program. In 2015-16, she taught the Environmental Law Clinic and the new Grand Challenge course "Pathways to Renewable Energy" with co-instructor Paul Imbertson, Engineering Professor.

From 2012 to 2014, Anderson was Senior Advisor on Energy and Environment to Governor Mark Dayton and assisted the state Environmental Quality Board (EQB). From 2011-2012 she was Chair of the Minnesota Public Utilities Commission.

Anderson served in the Minnesota Senate from 1993–2011, representing several neighborhoods of St. Paul and the city of Falcon Heights. She chaired the Energy Committee, the Environment and Energy Finance Committee, and other key committees; served on the LCCMR for 10 years, and was a founding member of the Lessard-Sams Outdoor Heritage Council Her signature legislation includes the Renewable Energy Standard and many other energy laws, and she has an unparalleled knowledge of Minnesota renewable and clean energy law and policy.

Anderson holds a B.A. from Carleton College and J.D. *cum laude* from the University of Minnesota Law School. She has received dozens of awards for her leadership.