



Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-336

Proposal Title: Distributed Energy Storage Partnerships with Municipal and Cooperative Utilities

Project Manager Information

Name: Gabriel Chan

Organization: U of MN - Humphrey School of Public Affairs

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Project Basic Information

Project Summary: A research engagement platform to partner with municipal and cooperative utilities to develop and implement innovative utility programs for energy storage, enabling greater renewable energy deployment and local economic benefits

Funds Requested: \$364,000

Proposed Project Completion: 2024-06-30

LCCMR Funding Category: Air Quality, Climate Change, and Renewable Energy (E)

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

According to analysis commissioned by the Minnesota legislature last year, energy storage will become necessary for integrating solar and wind after 2030. To build expertise toward increasing storage's value to the grid, the commissioned analysis recommended pursuing targeted initiatives and programs in the next several years that prioritize cost-effective use cases of energy storage. Our proposal here is designed to do exactly this, focusing on the approximately 170 consumer-owned utilities (municipals and cooperatives) that serve 40% of Minnesotans.

Energy storage creates a "stack" of values that are not easily quantified nor regularly a part of compensation (e.g. storage can avoid the need for new peak generation capacity or upgrading electric distribution systems). While energy storage costs have fallen rapidly (2018 storage costs were one-third of their costs five years prior), existing utility practices do not always make storage deployment desirable. Under existing rules, energy storage can sometimes create little value and large cost shifts for consumers. New utility practices are needed to align the system benefits of energy storage with fair consumer benefits. Understanding and implementing fair compensation for storage is a primary barrier to broader deployment, but context-specific research and innovation in utility programs are needed.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

To fairly compensate storage and confidently develop new programs to deploy energy storage, our project will build the evidence utilities need to thrive as the energy system transitions from one primarily powered by fossil fuels to one with larger amounts of renewable energy. The primary goal of our project will be to develop new pilot programs for distributed storage that consumer-owned utilities can implement. We will conduct rigorous, contextual analysis to support the development of these pilots to identify opportunities that fairly allocate the costs and benefits of storage.

Building on existing research partnerships with consumer-owned utilities and a 2018 LCCMR project on community-scale energy storage focused on installing demonstration projects, we propose to build new partnerships with municipal and cooperative utilities for applied research studies and pilot-program development for energy storage. Our project will create new partnerships with three to four utilities that represent the diversity of municipal and cooperative utilities in Minnesota (geographic diversity, structural diversity, and diversity in generation providers). We will engage multiple organizations to provide program direction, technical consultation, and professional facilitation. Together, we will implement techno-economic modelling, social science research (e.g. consumer surveys), interactive stakeholder workshops, program evaluation, and public dissemination and education.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

This project seeks to find scalable, replicable knowledge and business models for distributed energy storage, which could be a game-changer for integrating larger amounts of intermittent renewable energy and decreasing emissions in Minnesota. In addition, distributed energy storage can reduce land resource requirements as compared to larger-scale storage and renewable energy projects. By maximizing the synergies of consumers, utilities, and the electric grid, this project aims to develop cost-effective solutions for consumer-owned utilities that will increase system efficiency, reduce the need for overbuilding energy infrastructure, and preserve resources.

Activities and Milestones

Activity 1: Facilitate Partnerships, Learning, and Dissemination

Activity Budget: \$69,468

Activity Description:

A diverse cohort of three to four municipal and cooperative utilities will be selected as partner utilities (at least one in Northern Minnesota; at least one in predominantly suburban and rural areas; at least one municipal and one cooperative; with at least three different generation providers). Research teams composed of graduate students, faculty, and staff from interdisciplinary backgrounds will interview and engage with utilities and their stakeholders to assess the needs and priorities of the utility related to distributed energy storage, environmental goals, local economic conditions, and current energy-system pressures. Additional avenues for deeper collaboration will also be explored and adopted as appropriate (e.g. summer internships and class projects).

With monthly meetings to facilitate the partnership throughout the project, three reports will be created and timed with annual stakeholder meetings open to all consumer-owned utilities and their stakeholders to disseminate results and gain feedback. Internally, as we move into the pilot-development stage of the project in January 2023, we will use the monthly meetings to monitor and evaluate implementation of pilots and troubleshoot. After the pilots are completed in December 2023, we will create a final report by May 2024 to summarize our three-year research platform process and results.

Activity Milestones:

Description	Completion Date
Select three or four cooperative and municipal utilities and finalize work plan.	2021-09-30
Create report of comparative policy analysis, modeling, and early research of distributed energy storage potential in Minnesota	2022-05-31
Create report of early pilot results and research platform progress	2023-05-31
Hold annual workshops with wider municipal, cooperative utility stakeholders for report dissemination, feedback	2024-05-31
Create report of final pilot evaluation, utility learnings, and research platform results	2024-05-31

Activity 2: Conduct Research, Develop Pilot Programs, Implement, and Evaluate Success

Activity Budget: \$294,532

Activity Description:

With our research team and rigorously selected external technical consultants, we will conduct an analysis of residential energy storage programs across the nation, abroad, and within Minnesota. Following feedback from utility partners and the consumers they serve, we will conduct techno-economic modeling to assess the potential for energy storage pilot programs to create economic benefits and meet environmental goals. We will conduct this analysis for a variety of energy storage pilot program scenarios, simulating consumer, utility, or industry activity in response to different utility energy storage program designs. Inputs and feedback from utilities and their stakeholders will help us establish criteria for pilot program models based on our analytic assessment of distributed energy storage programs. We then will work with each of the utility partners to select pilot programs for implementation. Using the final agreed-upon pilot designs in December 2022, we will implement the pilot in 2023, collecting quantitative and qualitative data throughout the implementation period, to be summarized at the end of the year. Utilizing that data, our three years of modeling iteration, and programmatic knowledge, we will calculate the overall estimated impact of each program in relation to economic and environmental criteria we and our utility partners select.

Activity Milestones:

Description	Completion Date
Complete comparative analysis of residential energy storage programs and distill potential applications in Minnesota	2022-05-31
Complete modeling of energy storage pilot programs	2022-08-31
Preliminary and final design(s) of pilot program(s) in collaboration with utility partners	2022-12-31
Collect data with utilities during implementation of pilot program	2023-12-31
Complete analysis and assessment of energy use and environmental impacts of energy storage pilot programs	2024-05-31

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Aaron Hanson	UMN Institute on the Environment	researcher	Yes
Lissa Pawlisch	Clean Energy Resource Teams	staff support for expertise, consulting, facilitation, project direction	Yes
Trevor Drake	Great Plains Institute	staff support for expertise, consulting, project direction	Yes

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?

We will implement the pilot programs throughout Years 2 and 3 as a direct result of this project. After the evaluation stage in Year 3, utilities will choose to modify or extend the pilot programs to fit their needs. All ongoing efforts at that point will be funded through utilities or in combination with other outside sources that consumer-owned utilities regularly access (e.g. federal finance for cooperative utilities, municipal bonds for municipal utilities). With the project's completion, we will provide all reports, stakeholder findings, and research findings to the public via an online repository.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Demonstrations for Community-Scale Storage System for Renewable Energy	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 07b	\$550,000

Project Manager and Organization Qualifications

Project Manager Name: Gabriel Chan

Job Title: Assistant Professor

Provide description of the project manager's qualifications to manage the proposed project.

Gabriel Chan is an Assistant Professor at the Humphrey School of Public Affairs and Affiliate Faculty at the Law School at the University of Minnesota-Twin Cities with over 10 years of experience researching energy and climate policy. Professor Chan's recent research has focused on consumer-owned utilities, state and national renewable energy policies, community solar programs, energy innovation, and international climate and sustainable development policy. His writing has appeared in publications such as The Electricity Journal, Nature, The Proceedings of the National Academies of Science, and The Energy Journal.

Professor Chan is a faculty member of the Center for Science, Technology, and Environmental Policy (CSTEP) at the University of Minnesota and is the Principal Investigator of the Chan Lab. CSTEP is a nationally recognized academic research center that fosters interdisciplinary and community-engaged research on human well-being, environmental sustainability, and social justice in a complex and diverse world. The Center conducts public engagement with external partners, develops environmental leadership, and facilitates solutions-oriented projects at the nexus of science, technology, and environmental policy. Chan is also a Faculty Associate at the Institute on the Environment (IonE) at the

University of Minnesota. IonE enables a future where people and planet prosper together through interdisciplinary scholarship and engagement with society outside the academy.

Chan has a PhD in Public Policy from Harvard University and a B.S. in Political Science and in Earth, Atmospheric, and Planetary Science from M.I.T.

Organization: U of MN - Humphrey School of Public Affairs

Organization Description:

The Humphrey School of Public Affairs at the University of Minnesota ranks among the country's top 10 professional public policy and planning schools, widely recognized for its success in advancing the common good through a comprehensive, world-class program. The School offers six distinctive master's degrees, a doctoral degree, and six certificate programs that match students' passion with the knowledge, skills, and experience needed to solve real-world challenges.

The mission of the Humphrey School of Public Affairs is to inspire, educate, and support innovative leaders to advance the common good in a diverse world.

Long noted for equipping students to play key roles in public life at the local, state, national, and global levels, the Humphrey School is respected for its role in shaping public policy, its focus on social justice and human rights, and its expertise in planning, leadership, and management.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Gabriel Chan		Principal Investigator			36.5%	0.24		\$43,164
Aaron Hanson		Investigator			36.5%	0.24		\$17,709
Lissa Pawlisch		Investigator			36.5%	0.27		\$21,131
To Be Named (2) two positions		Graduate Research Assistant			123.17%	1.11		\$71,721
To Be Named		Research Support Staff			31.8%	0.36		\$25,725
To Be Named, Institute of Environment staff		Researcher			36.5%	0.4		\$30,512
To Be Named, Institute on Environment staff		Researcher			36.5%	1		\$78,410
							Sub Total	\$288,372
Contracts and Services								
Great Plains Institute	Sub award	Subcontract to great Plains Institute: Staff support for expertise, consulting, project direction. \$10,000 in years 1 & 2				0		\$20,000
To Be Determined Technical Consultant	Professional or Technical Service Contract	Technical Consultant: research and technical support, consulting \$15,000 in years 1,2,3. We will rigorously select an external technical consultant to assist with techno-economic modelling tailored to the partner utilities and pilot deployment models we will study.				0		\$45,000

							Sub Total	\$65,000
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Includes quarterly travel to partner utility offices across Minnesota	Building reciprocal partnerships with utilities across the state will require travel time of researchers based at UMN and throughout the state to meet in person					\$3,000
							Sub Total	\$3,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	\$250 in years 1,3 , \$2,500 in year 2 for summary publications	Dissemination of research to broader set of stakeholders in professional reports that clearly communicate findings					\$3,000
							Sub Total	\$3,000
Other Expenses								

		Workshop costs	Workshop costs to convene munis and co-ops, their generation partners, and external experts to disseminate results and receive feedback on tools. \$1,000 in years 1 & 2 \$2,628 in year 3. The workshops we propose will be full-day convenings with professional facilitation to engage key stakeholders. During the workshops, detailed technical results will be presented and participants will be given substantial opportunity to provide feedback and learn from the research team and utility partners.					\$4,628
							Sub Total	\$4,628
							Grand Total	\$364,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

Attachments

Required Attachments

Visual Component

File: [136892f3-9b6.pdf](#)

Alternate Text for Visual Component

A four paneled-figure: (1) energy storage can enable the integration of intermittent renewable energy, (2) energy storage costs are declining and deployment is rising nationally, (3) in Minnesota, energy storage deployment is rising but mostly in investor-owned utilities, (4) our proposed research platform will advance pilot programs, reports, and workshops with a cohort of partnering utilities that will inform decision making in all municipal and cooperative utilities.

Optional Attachments

Support Letter or Other

Title	File
Audited Financial Report 2019	44bbfc5b-a8f.pdf
GPI letter of commitment	d7947b94-1c2.pdf
Letter of Institutional Endorsement on behalf of the UMN Regents	fdd4cd50-631.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

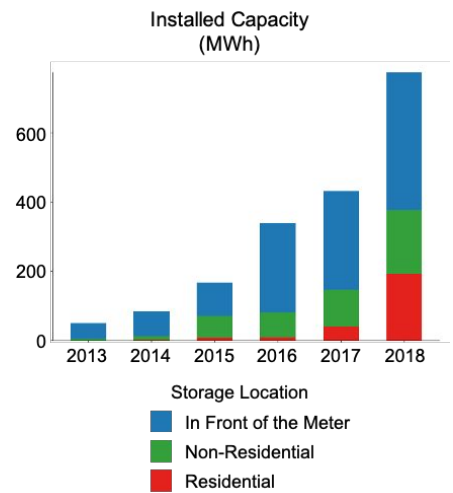
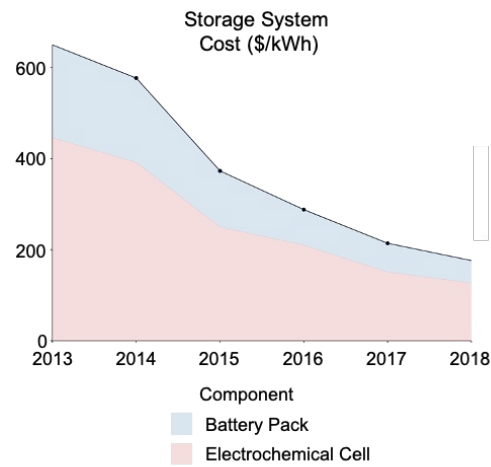
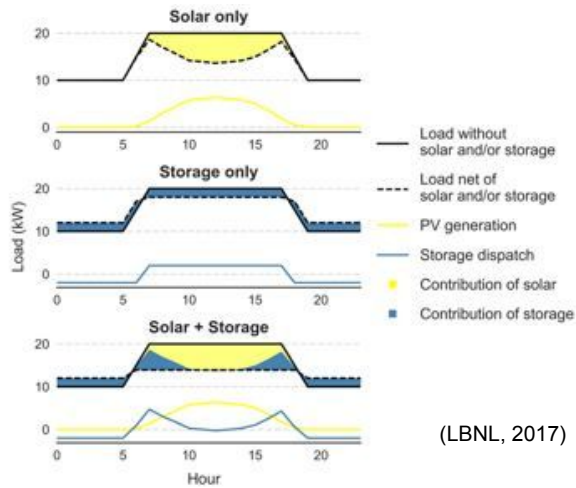
Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

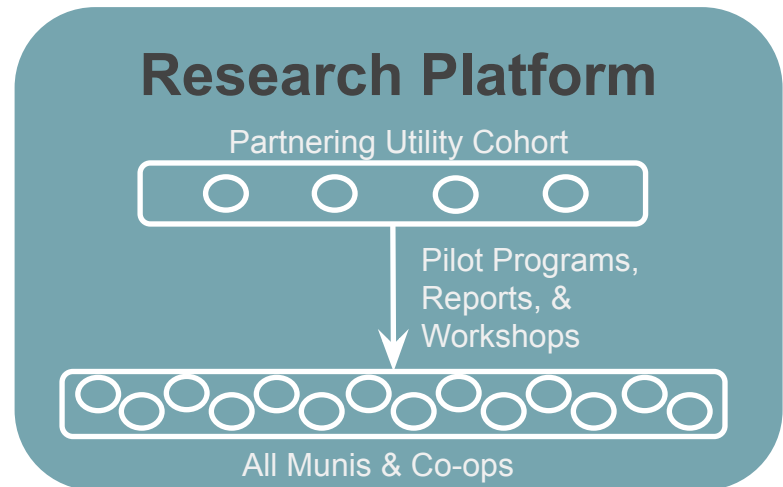
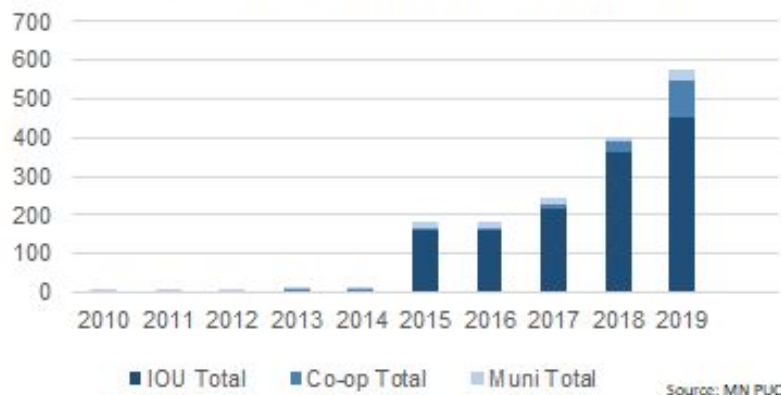
Distributed Energy Storage Partnerships with Municipal and Cooperative Utilities



1 Integrating renewable energy while creating environmental benefits and saving costs is creating new challenges on the electric grid. Energy storage can solve some of those challenges.

2 Energy storage costs are falling (left), creating new business opportunities across the nation, mostly for large-scale projects (right).

Minnesota's Distributed Energy Storage Deployment, 2010-2019 by Kilowatts of Capacity and Utility Type



3 While large-scale energy storage projects take off across the nation, energy storage remains small in Minnesota. For distributed energy storage projects, cooperative and municipal utilities lag behind investor-owned utilities.

4 Our research platform can help develop new insight to deploy distributed storage in cooperative and municipal utilities, helping them cut emissions and equitably cut costs.

Gabriel Chan (Principal Investigator)

