

**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

**Office Telephone:** (612) 626-3292

**Email:** gabechan@umn.edu

## **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. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified 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** |

### **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](https://lccmrprojectmgmt.leg.mn/media/map/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](https://lccmrprojectmgmt.leg.mn/media/attachments/44bbfc5b-a8f.pdf) |
| GPI letter of commitment | [d7947b94-1c2.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/d7947b94-1c2.pdf) |
| Letter of Institutional Endorsement on behalf of the UMN Regents | [fdd4cd50-631.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/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