

Energy Research Grants
Cycle 18 - REQUEST FOR PROPOSAL

Issue Date of RFP March 20, 2023
 Preproposal Due May 15, 2023 – 1:00 p.m. CDT
 Full Proposal By Invitation Only

- A. **DESCRIPTION.** The Nebraska Center for Energy Sciences Research ([NCESR](#)), a collaboration between the Nebraska Public Power District ([NPPD](#)) and the University of Nebraska-Lincoln (UNL), was established to enhance UNL research on renewable energy sources, energy efficiency and energy conservation; and to expand economic opportunities and improve quality of life for Nebraska and the nation.

- B. **GOAL.** The overall goal of NCESR is to foster research and education in energy sciences by providing funding to support innovative research and collaboration among UNL faculty and with other public- and private-sector organizations and businesses. More information about the Energy Center and previously funded energy research grants can be found at ncesr.unl.edu.

- C. **RESEARCH – CYCLE 18 FOCUS AREAS.** NCESR seeks innovative research proposals that address science or technologies in the focus areas of: Cybersecurity; Energy Storage; Carbon Sequestration; Hydrogen Generation; Electric Powered Tractors/Class VI Vehicle Testing; Energy Infrastructure Resilience; Energy Literacy; Non-Carbon Combustion Fuel for Utility Scale Gas Turbines and Reciprocating Internal Combustion Engines (RICE); and Ethanol Fuel for Aviation; Nuclear Technologies; Simulation and Modeling; and Nebraska Hydrogen Hub. Proposed research may include, but need not be limited to, the topics identified within each focus area below.
 - **Cybersecurity:** Research and development of innovative tools and techniques to reduce risks to Nebraska’s energy infrastructure posed by cyber and/or physical threats. This could be extended to infrastructure across the Regional Transmission Authority as well. Focus could be in strengthening energy sector cybersecurity *preparedness*, coordinating cyber *incident response and recovery*, and development of innovative *cyber-resilient energy delivery systems*.

 - **Energy Storage:** Develop or improve energy storage technologies that have potential to operate at scale. This may include hydrogen production and storage to better support the electric grid. Approaches may include significant advancements in the energy density or operational lifetimes of existing technologies or through unique application of novel grid-enabled schemes.

 - **Carbon Sequestration:** Development of innovative technologies for CO₂ capture, storage or transformation using mechanisms that are geologic, biologic, or chemical in character.
 - **Sequestration technologies** through agricultural practices involving incorporation of agricultural bio-waste, introduction of soil additives (biochar or other materials), and innovative methods.
 - **Carbon measurement standards:** In coordination with U.S. Department of Agriculture (USDA) to develop scientific standards to enable the USDA to publish best practices for activities that prevent, reduce, or mitigate greenhouse gas emissions across agriculture and managed forests. The aim is to connect landowners to private and public sector actors who can assist the landowners in implementing protocols and monetizing the climate value of their sustainable practices. As part of this process, provide input to the USDA to support their role in implementing the “Growing Climate Solutions Act” which would create a registration program



- at USDA for those involved in carbon credit markets. Unlike a typical research project, this is a technical contribution in terms of policy and standard practice by users.
- **Alternate uses of CO₂ not related to Biochar:** Investigate direct uses of CO₂ including chemical extraction, food industry applications, and chemical production of commodities and fuel.
 - **Large Scale CO₂ Sequestration:** Environmental impact of long-term (permanent) sequestration sourced by removal of massive amounts of CO₂ directly from the oceans or atmosphere.
 - **Decarbonization of Heavy Industries:** Direct conversion of CO₂ to solid carbon over liquid metals and metal alloys (see recent publication; DOI: 10.1039/d1ee03283f for foundational concepts).
- **Hydrogen Generation:** Develop new or improved technologies to separate hydrogen that meet the DOE's Hydrogen Energy Earthshot goals and other corresponding requirements. [Hydrogen Shot | Department of Energy \[energy.gov\]](#)
 - **Electric Powered Tractors/Class VI Vehicle Testing:** Develop appropriate testing protocols for class VI vehicles, tractors or other industrial prime movers that utilize electric motors. These motor driven devices may be powered by electricity from batteries, hydrogen fuel cells, or other storage/production technologies.
 - **Energy Infrastructure Resilience:** Research and development of innovative technologies for the infrastructure related to energy control and delivery, energy sources, and communication systems to withstand or recover quickly from severe weather, environmental, or human intervention (intentional or accidental).
 - **Energy Literacy:** Development of programs or material for enhancement of the broad knowledge about energy sources, the electric grid, and current technology limits of energy storage, generation, carbon sequestration, renewable energy, and other related topics. Programs should engage the public and/or students (university and/or K-12). Studies of the societal impact of energy technologies are also of interest. Unlike a typical research project, this is an engagement activity that should clearly state the partnership to be formed and the details of the interactions and exchanges.
 - **Non-Carbon Combustion Fuel for Utility Scale Gas Turbines and Reciprocating Internal Combustion Engines (RICE); and Ethanol Fuel for Aviation:** Research and development of new non-carbon fuels, synthesis or production of these fuels, and innovative RICE and gas turbine designs to use these fuels for electricity production. Research may also investigate ethanol as a higher value fuel for aviation.
 - Carbon free combustion fuels for gas turbines and RICE such as use of ammonia/hydrogen fuel blends for use in electrical energy production.
 - Research also could include investigations of ethanol or its derivatives as fuel for jet engines and RICE. This may include for commercial and military aviation.
 - **Nuclear Technologies:** Development of innovative technologies for co-generation with Small Modular Reactors (SMR); development of evaluation criteria for SMR's; coolant designs incorporating or comparing water, gas, liquid metals, and liquid salts; and development of fuel re-processing technologies assuming a future with a closed nuclear fuel cycle.
 - **Simulation and Modeling:** Development of computational models and their use in unique predictive or optimization modes so as to investigate fundamental processes related to: design and fabrication of energy materials, operation of biological processes to generate bio-fuels, tools for CO₂ capture, devices and sub-systems, and large-scale integrated energy systems such as the electric grid.

Special Short-term Support Program in Hydrogen Technology

- **Nebraska Hydrogen Hub:** Funding for a short cycle project (of up to 3 months duration) to support university researchers collaborating to develop the best concept of university support for the Nebraska Hydrogen Hub as described in the Federal Infrastructure Bill (H.R. 3684) – Regional Clean Hydrogen Hubs (Sec. 40314). The NCESR award will be made based on the preproposal document only, on **July 1, 2023, and with a limited maximum budget allowed of \$30,000**. The proposed project should be within one of the major areas of Agriculture, Energy, Transportation, or Environmental, Social, and Economic Development. Proposers should contact the NCESR for further details.

D. RESEARCH TEAM.

1. The research team includes the Principal Investigator (PI), and at least one Co-Investigator, but may be up to two Co-Investigator(s) and other internal and/or external members as appropriate to successfully perform the proposed work.
2. The PI must be a current UNL faculty member holding a tenured, tenure-track (e.g., Assistant, Associate, or Professor), *or* nontenure-track faculty appointment (e.g., Research Assistant, Research Associate, or Research Professor).
3. The Co-Investigator(s) must be current UNL faculty. The Co-Investigator(s) must be willing and able to take on the role of the PI in the unforeseen event the PI no longer can perform that function. The Co-Investigators must hold a tenured, tenure-track, *or* nontenure-track faculty appointment.
4. UNL faculty may serve as the PI for only one (1) preproposal; however, any individual may serve as a Co-Investigator on multiple preproposals.
5. UNL faculty not designated as the PI and Co-Investigator(s) are to be identified as participants on the research team.
6. Researchers from other universities and/or external partners from the private-sector may also be members of the research team but cannot receive any NCESR funding.

E. COLLABORATION AND INNOVATION. Preproposals from interdisciplinary teams will be given priority, especially those resulting in disruptive innovations and clean energy technology that impact Nebraska, the nation, and the world.

F. FUNDING. Funding to support energy sciences research is provided by the [NPPD](#) to UNL and administered by the [NCESR](#).

G. PROJECT PERIOD.

1. The intent is for the effective start date to be January 1, 2024.
2. The project period for Year 1 is intended to be January 1, 2024 – December 31, 2024.
3. The end date for awards with authorized Year 2 funding is intended to be December 31, 2025, which makes the two-year project period January 1, 2024 – December 31, 2025. **Note:** If selected, only the Year 1 project period will be initially authorized; the end date will be extended to include the second year if the provisional Year 2 funds are authorized.

H. BUDGET. The maximum budget request for the preproposal is as follows:

1. Cybersecurity; Energy Storage; Carbon Sequestration; Hydrogen Generation; Electric Powered Tractors/Class VI Vehicle Testing; Energy Infrastructure Resilience; Energy Literacy; Non-Carbon Combustion Fuel for Utility Scale Gas Turbines and Reciprocating Internal Combustion Engines (RICE); and Ethanol Fuel for Aviation; Nuclear Technologies; Simulation and Modeling; and Nebraska Hydrogen Hub:



- a. For a one-year (12 month) research project, the maximum budget is \$85,000.
 - b. For a two-year (24 month) research project, the maximum total budget is \$170,000: \$85,000 maximum for Year 1 and \$85,000 maximum for Year 2. However, Year 2 funding is provisional and contingent on the PI's demonstration of adequate project and financial performance as documented in the required progress report and the in-person presentation at the fall Progress Review Meeting in Year 1.
2. When estimating the total research budget requested for the preproposal, salary and benefits are not allowed for faculty holding tenured or tenure-track appointments. Nontenure-track faculty who serve as PI are allowed a maximum of one-month of salary and benefits (summer or academic).
- I. **EXPECTATION TO SEEK EXTERNAL FUNDING.** It is important and must be understood that those invited to submit full proposals and selected to receive funding are expected to actively submit proposals to secure external funding to supplement the energy research seed grant.
- J. **SELECTION.**
1. The final decision of which principal investigators will be invited to submit full proposals will be determined and provided by the Executive Council (EC) to the NCESR.
 2. The decisions of the EC are final.
- K. **PROCESS.** The process will involve two competitive stages: the preproposal and the full proposal. The full proposal is by invitation only.
- L. **PREPROPOSAL PREPARATION INSTRUCTIONS. Please read carefully.**
*University of Nebraska applications for internal funding must be submitted via the Internal Competitions module in [NuRamp](#). Sign in to [NuRamp](#) using your institutional credentials. Click on IC Application. Then from the drop down, select **Nebraska Center for Energy Sciences Research (NCESR) – Cycle 18 Preproposal Submission**.*
1. Preproposals are due by the date and time designated on page 1 of this RFP. **Requests for extensions or exceptions will not be accepted.**
 2. The preproposal document must:
 - a. Include the following information per requirements and in the order described – **as a single Word document file** and uploaded into the Nebraska Center for Energy Sciences Research (NCESR) – Cycle 18 Preproposal Submission in the Internal Competitions module in NuRamp, which is explained in the above first paragraph of the Preproposal Preparation Instructions section. **Any other type of file, such as a PDF, will not be accepted; thus, VOIDING the preproposal.**
 - b. **Not exceed five (5) pages** when printed using standard 8.5" by 11" paper with a minimum of one (1) inch margins (top, bottom, left and right) and font no smaller than 11 point.
 - c. **Include the order and requirements as follows:**
 - c1. Title/abstract – page 1.
 - The title/abstract page must not exceed one page.
 - The title/abstract page must provide:
 - The project title (15 word maximum).
 - The PI name, position title (e.g., Professor, Associate Professor, Research Assistant, Research Associate etc.), department name and contact information; and the Co-PI name, position title (e.g., Professor, Associate Professor, Research Assistant, Research Associate etc.), department name and contact information for a minimum of one Co-PI or a maximum of two Co-PIs.



- Name, title, the affiliation of other members of the research team.
 - A brief abstract (300 word maximum).
- c2. Narrative – pages 2 and 3.
- The narrative must not exceed two pages. References are to be included.
 - An omission of any of these sections voids the preproposal.
 - The narrative **MUST** include the following sections:
 1. A short, nonproprietary description of the project that can be understood by a nonscientific audience.
 2. The research goal and scientific objective(s) of the project including methods to be employed.
 3. The energy science merit and potential impact of the project (i.e., energy science innovation, benefits, outcomes).
 4. Sources where the principal investigator will apply for future funding.
 5. The proposed project length (one year/12 months or two years/24 months).
 6. The total budget request.
- c3. Curriculum Vitae – pages 4 and 5.
- The Curriculum Vitae must not exceed two pages.
 - The Curriculum Vitae must be for the Principal Investigator only and must include pending, current and past external funding from 2019-present.
3. A preproposal that does not follow all of the requirements will not be reviewed.
4. Once you have clicked “Submit” you are finished with the submission process for your application. Please disregard the statement about “The next step is Review Management”.
5. You will receive an e-mail notification confirming your application has been submitted by the next business day.

M. FULL PROPOSAL – By Invitation Only

Only the Principal Investigators who are invited to submit a full proposal in the second stage of the competitive process will be provided more specific information regarding the due date, requirements and instructions to electronically submit the full proposal.

N. PUBLICATION ACKNOWLEDGEMENT.

Please use the following acknowledgement format when referencing the Energy Center on your publications. “This work was supported by the Nebraska Public Power District through the Nebraska Center for Energy Sciences Research at the University of Nebraska-Lincoln.”

O. NCESR CONTACT.

For questions or more information, contact the Nebraska Center for Energy Sciences Research:

- Jerry Hudgins, Ph.D., Interim Director
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