

Energy Research Grants
Cycle 11 - REQUEST FOR PROPOSAL

Issue Date April 4, 2015
 Pre-Proposal Due May 20, 2015 – 5:00 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 11 FOCUS AREAS.** NCESR seeks innovative research proposals that address science or technologies in the focus areas of: materials; biofuels and bioproducts; water, energy and agriculture; renewable energy; and topics relevant to DOE Energy Frontier Research Centers (EFRC). Proposed research may include, but need not be limited to, the topics identified within each focus area below.

 - **Materials** —Energy storage methods and materials to directly store electric charge or for improved energy density and rapidity of chemical to electrical energy conversion; improved photovoltaic (PV) solar materials including improved solar PV installation approaches; improved lifetime or maintainability of nuclear reactor components; materials for energy efficient devices; materials for hydrogen utilization, materials for high temperature extreme applications and new uses for locally produced carbon black materials.
 - **Biofuels and Bioproducts** — Consolidated bioprocessing for biomass conversion to value added chemicals; biotransformation technologies to enhance renewable feedstock value; coproducts for bioethanol and biodiesel manufacturing systems; strategies to add sustainability to biofactories; lignin conversion technologies and products; technology and modeling that provides insight and impetus towards carbon dioxide capture, emission reduction, sequestration or feedstock utilization; big data approaches that advance bio-renewables; and bioenergy storage. Updated studies that scientifically document the greenhouse gas reducing benefits of biofuels.
 - **Water, Energy and Agriculture** — The research objectives are to: (1) increase agricultural income per unit of irrigation water used in Nebraska, (2) decrease peak-load irrigation-associated energy demand, and (3) improve crop water use efficiency during periods of high water demand and drought. These objectives include the potential to increase agricultural income per unit of crop irrigation and the potential to decrease peak-load irrigation associated electrical energy demand. Faculty are highly encouraged to address economic, energy efficient and environmental improvements relative to the cost of the research versus the profitability impact. Possible areas of research include, but are not limited to: improvements in nozzle and water sensor designs, better water modeling to reduce over irrigating of cropland. Establish the relationship between energy input for irrigation and resultant crop production.

Also establish the value of forecasting seasonal winds and understanding the resultant water demand from affected irrigated cropland.

- **Renewable Energy** – Develop improved methodologies for forecasting the availability of wind to support utility scale electricity production. Current methodologies are inadequate to accurately project the availability of wind on a daily and hourly basis necessary to effectively bid wind generation into the real time and day ahead electricity markets.
- **Energy Frontier Research Center (EFRC)** — See attached information sheet.

D. RESEARCH TEAM.

1. The research team includes the Principal Investigator (PI), up to two Co-Investigator(s) and other internal and/or external members as appropriate to successfully perform the proposed work.
2. The Principal Investigator (PI) must be current UNL faculty.
3. The Co-Investigator(s) must be current UNL faculty. One Co-Investigator is required, however, one additional Co-Investigator is allowed. 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.
4. Only individuals currently holding a UNL tenured or tenure-track appointment as an assistant, associate or (full) professor may be designated as the Principal Investigator (PI) or Co-Principal Investigator (Co-PI). Individuals currently holding a non-tenure-track faculty appointment are not allowed to serve as the PI or a Co-PI; however, may be identified as members of the research team.
5. UNL faculty may serve as the PI for only one (1) pre-proposal; however, any individual may serve as a Co- Investigator on multiple pre-proposals.
6. UNL faculty not designated as the PI and Co-Investigator(s) are to be identified as participants on the research team.
7. Researchers from other universities and/or external partners from the private-sector may also be members of the research team.

E. COLLABORATION AND INNOVATION. Pre-proposals 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 Nebraska Public Power District (www.nppd.com) to UNL and administered by the Nebraska Center for Energy Sciences Research (ncesr.unl.edu).

G. PROJECT PERIOD.

1. The intent is for the effective start date to be January 1, 2017.
2. The project period for Year 1 is intended to be January 1, 2017 – December 31, 2017.
3. The end date for awards with authorized Year 2 funding is intended to be December 31, 2018; which makes the two-year project period January 1, 2017 – December 31, 2018. 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 pre-proposal is as follows:

1. Materials; Biofuels and Bioproducts; Water, Energy and Agriculture; and Renewable Energy:
 - a. For a one-year (12 month) research project, the maximum budget is \$75,000.
 - b. For a two-year (24 month) research project, the maximum total budget is \$150,000: \$75,000 maximum for Year 1 and \$75,000 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 reports.

2. Topics relevant to DOE Energy Frontier Research Centers (EFRC):
 - a. For a one-year (12 month) research project, the maximum budget is \$150,000.
 - b. For a two-year (24 month) research project, the maximum total budget is \$300,000: \$150,000 maximum for Year 1 and \$150,000 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 reports.
3. When estimating the total research budget requested for the pre-proposal, salary and benefits are not allowed for faculty holding tenured or tenure-track appointments; however, salary and benefits are allowed for non-tenure-track faculty appointments provided a clear description of the role and responsibilities directly associated with the project is detailed in the budget justification of the full proposal, if invited to submit a full proposal.

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. NUgrant ROUTING IS NOT APPLICABLE.

This is an internal funding competition to UNL. Therefore, PIs do not enter this proposal in *NUgrant*, which is currently used only for proposals submitted for external funding.

K. SELECTION.

1. The final decision of which principal investigators will be invited to submit full proposals will be performed by the External Advisory Committee (EAC) to NCESR.
2. The decisions of the EAC are final.

L. PROCESS.

The process will involve two competitive stages: the pre-proposal and the full proposal, which is by invitation only.

M. PRE-PROPOSAL.

1. Pre-proposals 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 pre-proposal document must:
 - a. Be submitted as a *Word 2003* or *Word 2010* file. Any other type of file, such as a PDF, will not be accepted.
 - 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. The order and requirements are 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 name, position title (Professor, Associate Professor or Assistant Professor), department name and contact information for the Principal Investigator (PI)

- the name, position title (Professor, Associate Professor or Assistant Professor), department name and contact information for a minimum of one Co- Principal Investigator or a maximum of two Co-Principal Investigators
 - name, title, 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.
 - The narrative must include:
 - a short, non-proprietary description of the project that can be understood by a non-scientific audience
 - the research goal and scientific objective(s) of the project including methods to be employed
 - the energy science merit and potential impact of the project (i.e., innovation, benefits, outcomes)
 - sources where the principal investigator will apply for future funding
 - the proposed project length (one year/12 months or two years/ 24 months)
 - 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 2008-present.
3. To submit a pre-proposal, go to: <http://ncsr.unl.edu/event.php?eventID=1940>
Enter the information requested, attach the pre-proposal Word document and click on the “Submit” button.
4. A pre-proposal that does not follow all of the requirements will not be reviewed.

N. 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.

O. NCSER CONTACT.

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

- Michael Nastasi, Ph.D., Director
mnastasi2@unl.edu
402-472-3852

P. ATTACHMENTS.

1. Energy Frontier Research Centers (EFRC) Information Sheet



Energy Frontier Research Centers

U.S. Department of Energy,
Office of Science,
Office of Basic Energy Sciences

The Nebraska Center for Energy Sciences Research (NCESR) seeks pre-proposals for seed grants that would position UNL faculty to be more competitive for Energy Frontier Research Centers (EFRC) funding opportunities. EFRC FOAs are expected every two years. The last EFRC awards were given in 2014. The ceiling for seed grants given by the NCESR will be \$150,000 per year. Second year funding will be contingent upon performance in the first year. Address questions to Michael Nastasi, mnastasi2@unl.edu

EFRC SUMMARY

The 21st century brings with it significant challenges for advanced energy technologies, but as history has proven, major breakthroughs in clean energy technologies will likely be built on a deep foundation of basic research advances. Solar photovoltaic technology has its roots in Einstein's early twentieth-century paper on the photoelectric effect. The electronics used to improve the efficiency of today's internal combustion engine have their root in the transistor, whose development was enabled by the discovery of quantum mechanics. Key to exploiting such discoveries is the ability to create new materials using sophisticated synthesis and processing techniques, precisely define the atomic arrangements in matter, and control physical and chemical transformations. The energy systems of the future will revolve around materials and chemical changes that convert energy from one form to another. To control chemical reactions or to generate electricity from solar photons requires coordination of multiple steps, each carried out by customized materials with designed nanoscale structures. Such advanced materials must be designed and fabricated to exacting standards using principles revealed by basic science.

EFRC based NCESR seed grant applications will be required to address **both** use-inspired priority research directions identified by the DOE BES series of "Basic Research Needs" reports (<http://science.energy.gov/bes/community-resources/reports/>) **and** scientific grand challenges identified by the Basics Energy Sciences Advisory Committee (BESAC) in the report *Directing Matter and Energy: Five Challenges for Science and the Imagination* (http://science.energy.gov/~media/bes/besac/pdf/GC_rpt.pdf).

Seed grant applicants are encouraged to consider the incorporation of research approaches outlined in the following two reports: 1) *Computational Materials Science and Chemistry: Accelerating Discovery and Innovation through Simulation-Based Engineering and Science*; and 2) *From Quanta to the Continuum: Opportunities for Mesoscale Science*. All of these reports can be found here: <http://science.energy.gov/bes/community-resources/reports/>.

EFRC Key Words for Topical Areas of Interest (alphabetical): biofuels (non-fermentative approaches); bio-inspired energy science; carbon capture; carbon storage and sequestration; catalysis; combustion; energy storage; extreme environments; hydrogen and fuel cells; materials and chemistry by design; mesoscale science; nanoscale science; nuclear (including radiation effects); solar fuels; solar photovoltaic; solar thermal; solid state lighting; superconductivity; thermoelectrics

A copy of the last EFRC FOA is available from the NCESR upon request.