THE POWER OF PEOPLE

Energy Center Benefits for NPPD Customers

NPPD Board of Directors Meeting

April 2025

Alan Dostal

Associate Director of Research

Nebraska Public Power District

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Energy Center Achievements

- Proving the greenhouse gas reducing benefits of ethanol which had a positive influence on the EPA's regulatory determinations for ethanol
- By some estimates, these determinations have brought millions of dollars in benefits to Nebraska and our customers

Kenneth Cassman

Emeritus Robert B. Daugherty Professor of Agronomy & Horticulture (Founding Energy Center Director)

EPA – Environmental Protection Agency

Energy Center Achievements

- Proving the benefits of feeding wet distiller's grains to beef cattle in Nebraska
- One estimate is approximately $100M per year benefit to Nebraska

Galen Erickson

Beef Feedlot Nutrition Specialist, Extension Specialist

Energy Center Achievements

Improving ethanol plant efficiency

- EXTREMASE is an enzyme cocktail that dissolves fiber, stalks, and shells for sugar fermentation and oil release.
- A 100 million gallon per year ethanol plant can generate an estimated 1 million bonus gallons of cellulosic ethanol with the same amount of corn
- Total Return on Investment (ROI) for the plant is improved since Extremase is reused rather than purchasing new enzyme

*Water, Energy and Agriculture Initiative**

Phase 1 (2008-2012):

1. Improved Irrigation Pumping Plant Performance
2. Improve the Efficiency of Water and Energy Use in Nebraska's Irrigation Soybean Production Systems
3. Benchmarking Corn Water Productivity in Nebraska Irrigated Cropping Systems
4. Evaluation of Biofuel Driven Irrigation Pumps and/or Electric Generators for Use During Peak Electricity Demand
5. Optimization of Irrigation Efficiency of Center-pivot Systems Using Spatial and Temporal Data Integration

Phase 2 (2013-2015):

1. Developing CornSoyWater: A Web-based Irrigation Decision Aid for Corn and Soybeans in Nebraska
2. Improving Irrigation Water and Energy Use Efficiency through Accurate Spatial and Temporal Management

*Collaboratively funded by the Corn Board, Soybean Board, UNL Ag Research Division and the Energy Center

CornSoyWater: Real-Time Aid for Corn and Soybean Irrigation Decisions

- (cornsoywater.unl.edu) UNL's online irrigation decision support tool, is designed to help corn and soybean farmers evaluate plant water needs and make irrigation decisions before they even drive to their fields. The program is free and designed to be user friendly.

University of Nebraska Lincoln

Water, Energy and Agriculture Initiative WEAI

High Plains Regional Climate Center

Nebraska Corn Board

Water for Food

Soybeans Nebraska Soybean Board

Energy Center Achievements

Project: Implementation of Synthetic Biology for Next Generation Biofuel Crop Improvement

- *This funding gave us unique expertise that enabled funding from the Department of Energy (DOE), National Science Foundation (NSF)* , Experimental Program to Stimulate Competitive Research (EPSCoR and the Nebraska Soybean Board. Approximately $24 million in funding.

Dr. Edgar Cahoon

- Research has expanded into improving the oil production capabilities of sorghum and camelina plants
- *"The funding undoubtedly made us more competitive for external funding. We are very thankful for the funding."*

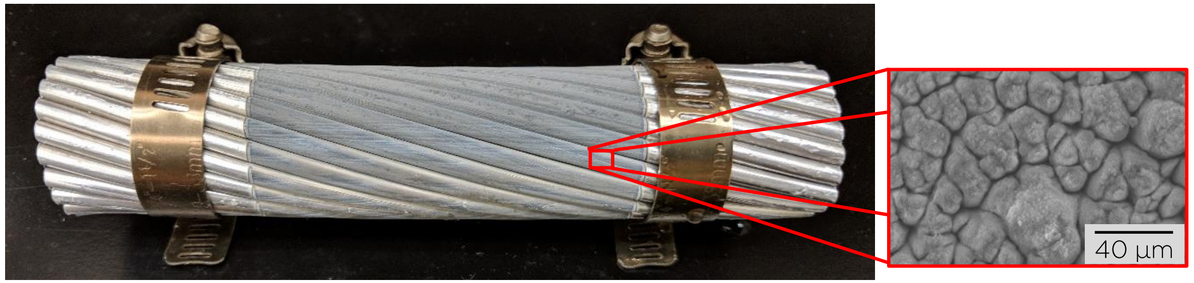
Conversion of CO_2 and carbonates to methane and (bio)isoprene

- Bioisoprene is a natural organic compound that occurs in plants that has industrial applications
- UNL researchers have created engineered methanoarchaea that can grow from agricultural waste in anaerobic digesters to produce both methane and isoprene
- Next step is to optimize and scale up production of these valuable co-products

Applying Femtosecond Laser Surface Processing (FLSP) to Produce a Superhydrophobic Surface on a Powerline Cable

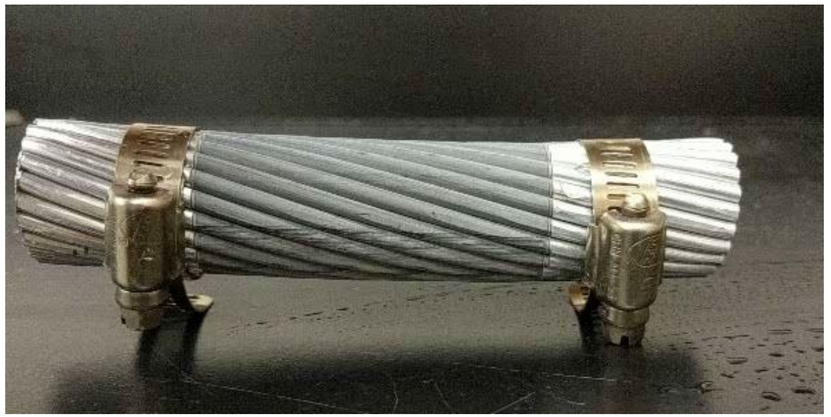
CEFS Center for Electro-Optics & Functionalized Surfaces

EPRI ELECTRIC POWER RESEARCH INSTITUTE



Powerline cable functionalized using FLSP to be superhydrophobic (dark region has been laser processed)

NPPD March 19, 2025, Power Line Ice Damage

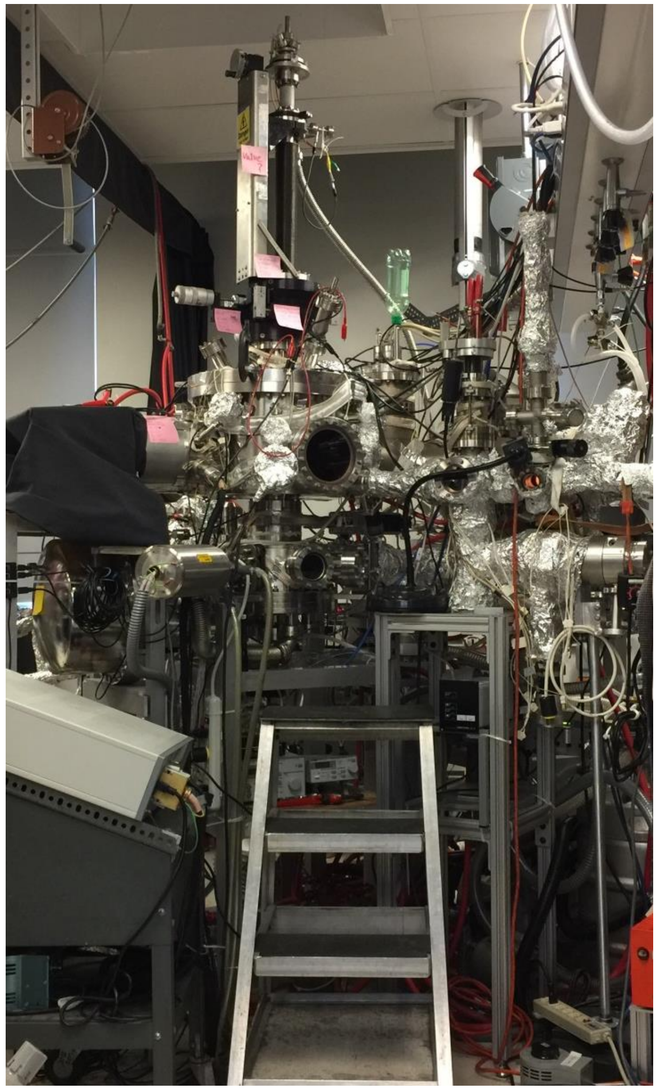


Video: note how the water droplets roll off of FLSP functionalized region and wick into the powerline on the unprocessed region

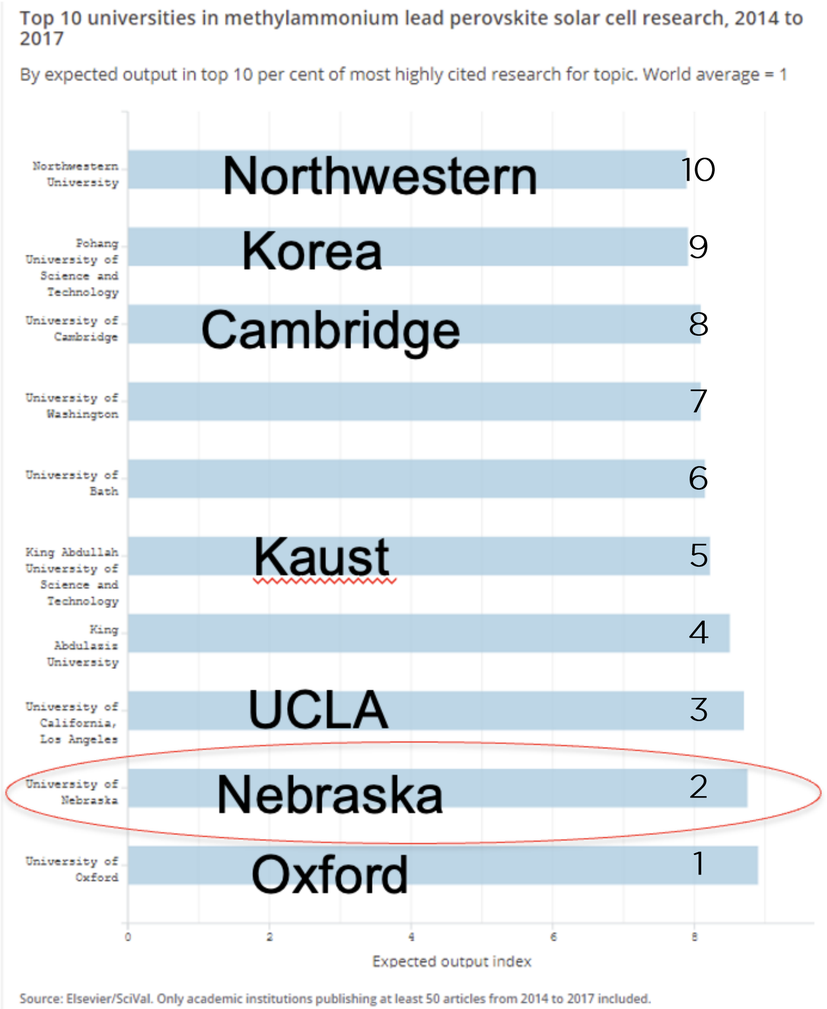
Video: when the superhydrophobic region is submerged in water there is a silvery sheen over the surface from an air film (processed surface remains dry even when submerged)

World Class Research at UNL

- In energy related materials, UNL is a top performer
- UNL was No. 2 in the world for novel materials in photovoltaic research in 2017
  - In part because of the leadership by the College of Engineering, prior Energy Center leadership, and because of NPPD support



Top universities and researchers in perovskite solar cell research



Energy Center Collaborations

Vehicle Electrification for Off-Road & Heavy-Duty Industry Applications Workshop

The purpose of this workshop was to:

- Hear industry defined technical barriers, needs, and future directions
- Explain/show existing expertise and infrastructure to industry participants
- Forge new relationships and enhance existing or previous relationships

Industry Representatives

John Deere

Ford

AEM

McNeilus GET IN.

OSHKOSH 100 YEARS MAKING A DIFFERENCE SINCE 1917

University of Nebraska Lincoln | Nebraska Center for Energy Sciences Research

Institute of Agriculture and Natural Resources
Nebraska Tractor Test Laboratory

Energy Center Collaborations

- Nebraska Digital Utility Summit: How Artificial Intelligence, Machine Learning and Advanced Analytics are Transforming the Energy Business
- Hosted at the Nebraska Innovation Campus on February 20, 2020
- Speakers from EPRI, IBM, SAP, Microsoft, Paige Wireless and UNL

Sponsors

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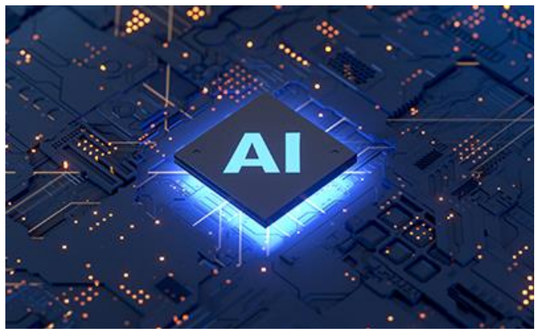
University of Nebraska Lincoln | Nebraska Center for Energy Sciences Research

College of Engineering
Electrical and Computer Engineering



Dave Webb NPPD kicking off the meeting

Julie Bushell of Paige Wireless

Dr. Jerry Hudgins, UNL

Entrepreneurship Workshop "From Idea to Startup"

Co-Hosted by Nebraska Center for Energy Sciences Research on July 22-23, 2024 – 3rd of a Series

- The workshop was open to all UNL STEM Researchers
- For those considering launching a company or may have already started the process, this workshop provided the tools and resources needed to succeed
- Included a Networking Event to interact with founders, experts, and service providers from the local entrepreneurship ecosystem

Roman Estrada, NPPD Generation Research Sr. Program Manager and NCESR Liaison participated as one of the speakers

innosphere ventures

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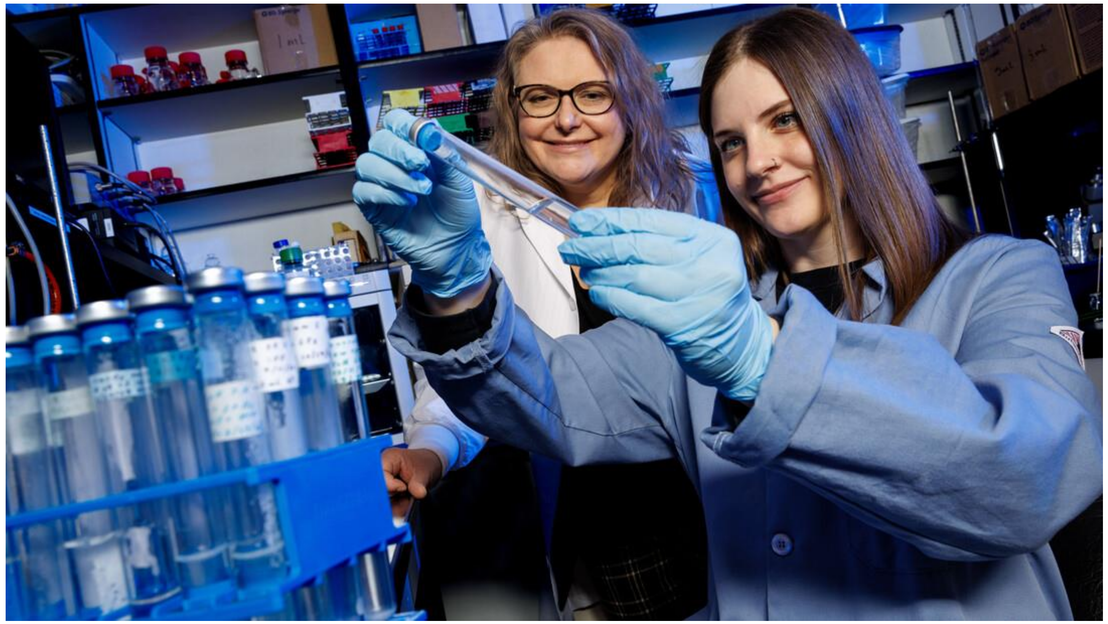
NUtech VENTURES

NEBRASKA CENTER FOR ENERGY SCIENCES RESEARCH

Energy Center Recognitions

Husker team's discovery could be key to sustainable bioenergy

- A University of Nebraska–Lincoln research team has identified new microscopic players in the global carbon cycle, a discovery that paints a clearer picture of carbon flow through the environment and provides key information for the sustainable development of bioenergy sources



Nicole Fiore (front), lecturer and former graduate student in biological sciences, and Karrie Weber, professor of biological sciences and Earth and atmospheric sciences, look at a culture of microorganisms in Weber's lab inside Manter Hall.

Energy Center Recognitions

Nebraska-based global center to drive bioeconomy solutions for future of food

- An international research project led by the University of Nebraska–Lincoln aims to transform the future of food by driving sustainable, resilient solutions, while positioning Nebraska as a national leader in the bioeconomy sector, which encompasses many industries that use biological resources for creating products and services
- FoodID is funded by the National Science Foundation with $2 million for the U.S. Hub, which includes UNL, Southeast Community College and North Carolina A&T.

Ozan Ciftci, Kenneth E. Morrison Distinguished Professor of food engineering, operates an integrated supercritical carbon dioxide extractor-bioreactor, using green technology to extract lycopene — a high-value health and wellness-promoting bioactive compound — from tomato waste while simultaneously producing biodiesel

Energy Center Collaboration - EPRI's Anda Ray spoke at Climate research Forum

On July 13, 2017, the Nebraska Public Power District and UNL's Nebraska Center for Energy Sciences Research, in partnership with the Electric Power Research Institute presented an educational forum entitled "Climate Change Research and Considerations in NPPD's Carbon-Emission Reductions". The featured speaker was Anda Ray, Senior Vice President, Environment and External Relations at the Electric Power Research Institute. NPPD's John McClure spoke on the topic of "Considerations in NPPD's Carbon-Emission Reductions." In addition, three NCESR projects were presented

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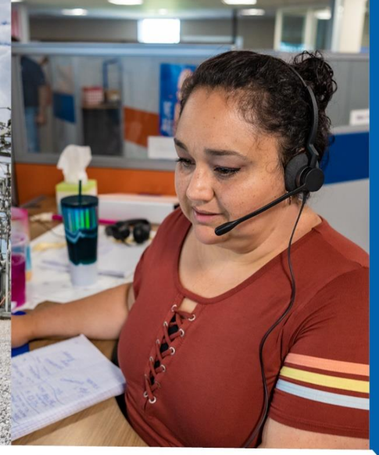
University of Nebraska Lincoln | Nebraska Center for Energy Sciences Research

EPRI | Electric Power Research Institute

Pursuing the Vision

- "If we can win national championships in football and volleyball, why not in research?," Paul said in a 2010 interview. "Why not capitalize on research and convert that into jobs, grow our economy and keep our young people, our kids and grandkids, here in Nebraska?"

Dr. Prem S. Paul – UNL Vice Chancellor for Research and Economic Development (1949 – 2016)



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Questions

Stay connected with us.

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