
# Climate Change and Energy: Basic Science, Impacts, and Mitigation

KANSAS EPSCoR Partners in Science & Technology

# Current NSF Awards to Kansas from the Experimental Program to Stimulate Competitive Research

## Research Infrastructure Improvement Track 1: $20 million 2009-2014

## Research Infrastructure Improvement Track 2: $3 million 2009-2012

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## Track 1

# Climate Change and Energy: Basic Science, Impacts, and Mitigation


WHO: **Kansas NSF EPSCoR** and the State of Kansas

WHAT: *Energy, Climate and the Future: The Role of Kansas*
A Planning Workshop for the Kansas NSF EPSCoR Phase VI Research Infrastructure Improvement Award.

WHERE: The Topeka Capital Plaza Hotel
1717 SW Topeka Blvd, Topeka, KS 66612

WHEN: **Please hold this date**: October 10, 2007

## Agenda

| | |
|---|---|
| 1:00 pm | Welcome and Introduction - **Kristin Bowman-James**, Project Director Kansas NSF EPSCoR |
| 1:15 | **Tracy Taylor**, President and CEO, Kansas Technology Enterprise Corporation |
| 1:30 | The Global Energy Challenge - **George Crabtree**, Director, Materials Science Division, Argonne National Laboratory |
| 2:15 | Climate Challenges – **Charles W. Rice**, Professor of Soil Microbiology, Kansas State University and Project Director Kansas EPA EPSCoR |
| 3:00 | Break |
| 3:15 | Panels on *Energy* and *Climate* (breakout) |
| 5:00 | Report-out and Wrap-up |
| 5:30 | Reception |
| 6:30 | Dinner/Banquet (Keynote speaker **Robert J. Noun**, Executive Director, External Affairs, National Renewable Energy Laboratory (NREL) |

# Climate Change and Energy: Basic Science, Impacts, and Mitigation

- Proposal submitted October 21, 2008
- $4 million/year for 5 years $\rightarrow$ $20 million
- 20% required match - $4 million
  - $1 million each from K-State and KU
  - $2 million Kansas Technology Enterprise Corporation (KTEC)
- Result: $24 million for 2009-2014
- Funded
- Start date: October 1, 2009


# Climate Change and Energy: Basic Science, Impacts, and Mitigation

- Four universities: K-State, KU, WSU, and Haskell Indian Nations University
- KTEC
- Three Kansas companies: Abengoa Bioenergy, MGP Ingredients, and Nanoscale
- Two companies outside of Kansas: ADM (IL) and Netcrystals (CA)
- Faculty: 64
- Graduate students: 40
- Undergraduates: 28

# Nanotechnology for Renewable Energy

Judy Wu

KU Distinguished Professor of Physics

- **Goal:** Use principles of nanotechnology for solar energy capture and conversion to fuel and electricity.
- **Composition:** Team of biologists, chemists, engineers, and physicists from KU, KSU, and WSU.
- **Plan:** Catalyze breakthrough ideas and transformational technologies on renewable energy.
- **Current private sector participation:** Abengoa Bioenergy, MGP Ingredients, and Nanoscale, ADM, and Netcrystals.
- **Economic Impact:** Networking with industry to train future workforce, create new jobs, and transfer technology.

# *Farmers' Decisions to Grow Crops*

Dietrich Earnhart,

KU Associate Professor of Economics

- **Goal:** Better understanding of farmers' cultivation choices.
- **Composition:** Team of KU and KSU economists, a civil engineer, sociologists, geographers, and anthropologists.
- **Plan:** Assess increase in biofuel crop cultivation ("benefits") and decrease in food, water, water quality ("costs") by examining previous and current land-use decisions.
- **Economic Impacts:** Improved understanding of impact of global climate change on agricultural sector and more informed policy decisions on biofuel and food crop cultivation, land conservation, and surface water quality.

# *Climate Change in the Great Plains*

Charles W. Rice, K-State

Distinguished Professor of Soil Microbiology

- **Goal:** Develop climate change scenarios via climate modeling for a better public understanding of climate change impacts.
- **Composition:** Team of biologists, geographers, agronomists, agricultural engineers, physicists, mathematicians, and computer scientists.
- **Plan:** Assess variability and feedback mechanisms that exist between soil moisture, vegetation and precipitation, and local impacts of climate change on natural and human systems.
- **Economic Impacts:** Identification of adaptation or mitigation strategies to minimize the impacts on the economy in Kansas.

# Workforce Development and Climate Change in Indigenous Communities

Dan Wildcat, Haskell Professor of American Indian Studies
Joane Nagel, KU Distinguished Professor of Sociology

**Goals:** Develop pathway for native students into STEM disciplines by providing (1) Summer Research Experience (REU) at Haskell for tribal college students; (2) Graduate Research Assistantships for tribal college REU graduates pursuing STEM graduate studies; and

(3) Predoctoral fellowships for tribal college REU mentors to complete terminal (PhD) degrees.

**Impacts**: STEM careers for Native American students and a Haskell-based National Center for Climate Change on Native Homelands.

# Roadmap: Based on the Strategy of the Intergovernmental Panel for Climate Change

Agriculture

Solar

| BASIC SCIENCE | IMPACTS | MITIGATION |
|---|---|---|
| **Climate** | | |
| Modeling Climate Variables<br>Feddema (KU)/Ma (WSU) | Kansas Farmlands<br>Harrington (KSU)/Gibson (KU) | C-Sequestration<br>Rice (KSU)/Rillema (WSU) |
| Modeling Human Variables<br>Earnhart (KU)/Peterson (KSU) | Indigenous Farmlands<br>Wildcat (Haskell)/Nagel (KU) | |
| **Energy** | | |
| Biomass → Biofuels<br>Sun (KSU)/Smith (KU) | Life Cycle Analysis<br>Twomey (WSU)/White (KU) | Biomass → Biofuels<br>Williams (KU)/Wang (KSU) |
| Solar energy → Electricity<br>Richter (KU)/D'Souza (WSU) | | Solar energy → Electricity<br>Wu (KU)/Li (KSU) |


## Track 2

# Oklahoma and Kansas: A cyberCommons for Ecological Forecasting

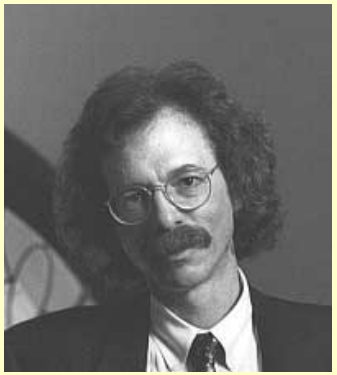

# Oklahoma and Kansas: A cyberCommons for Ecological Forecasting

- Proposal submitted January 9, 2009
- Four Universities, University of Kansas, Kansas State University, University of Oklahoma, and Oklahoma State University
- $2 million/year for 3 years → $6 million
- $1 million/year to K-State and KU split evenly
- Result: $3 million for Kansas 2009-2012
- Funded
- Start date: September 15, 2009

# Oklahoma and Kansas: A cyberCommons for Ecological Forecasting

Walter K. Dodds, K-State
University Distinguished Professor of Biology

Leonard Krishtalka, KU, Director Natural History Museum and Biodiversity Research Center, Professor Ecology and Evolutionary Biology



- **Goal:** Integrate science framework with cyber framework in ecological forecasting which will create a powerful environment for the discovery of knowledge and education - a “cyberCommons.”
- **Impact:** Maximize the ability to predict how global changes will affect Kansas ecosystems and ultimately Kansas stakeholders.

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- Kansas will harness the talents of researchers across the state to address two major issues of society today -- climate change and renewable energy.
- These interdisciplinary, multi-institutional research efforts bridge across the natural and social sciences, engineering.
- New cyberinfrastructure linkages in ecological forecasting will be established with Oklahoma.

Summary: Taken together, these initiatives will establish the State of Kansas as a key leader in research that addresses serious global challenges.