U.S. DEPARTMENT OF ENERGY | Office of Science

# Experimental Program to Stimulate Competitive Research (DOE EPSCoR)

**The National Academies**

**Committee on Science, Engineering, and Public Policy**

**Committee to Evaluate EPSCoR and Similar Federal Agency Programs**

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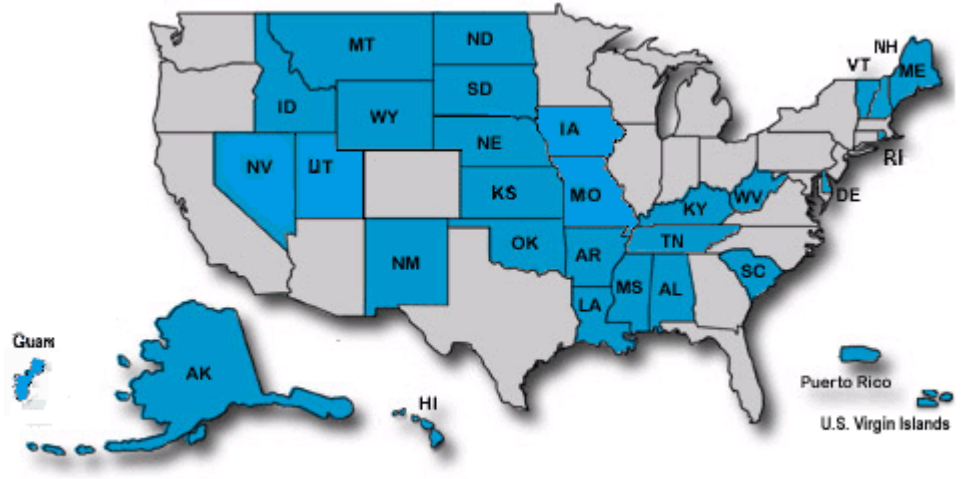
# EPSCoR Program History

The Experimental Program to Stimulate Competitive Research (EPSCoR) was authorized by Congress at the NSF in 1979 to broaden the geographical distribution of federal funding for academic research and development. Seven agency programs have been authorized to improve research competitiveness in states and territories that have been less successful in competing for Federal research support.




Map shows States eligible for NSF program and their year of entry into the program. DOE follows NSF eligibility criteria.

**Current Total DOE/NSF eligible entities: 31**

**1991 – Creation of DOE EPSCoR**

**FY1980**
Arkansas
Maine
Montana
South Carolina
West Virginia

**FY1985**
Alabama
Kentucky
Nevada
North Dakota
Puerto Rico
Oklahoma
Vermont
Wyoming

**FY1987**
Idaho
Louisiana
Mississippi
South Dakota

**FY1992**
Kansas
Nebraska

**1996 –DOE EPSCoR transitions to Office of Basic Energy Sciences (BES)**

**FY2000**
Alaska

**FY2002**
Hawaii
New Mexico

**FY2004**
Tennessee
Delaware
Virgin Islands

**FY2006**
New Hampshire
Rhode Island,
**Tennessee loses eligibility**

**FY2008**
Tennessee regains eligibility

**FY2009**
Iowa
Utah

**FY2012**
Missouri
Guam

# Eligibility for DOE EPSCoR is Based on NSF Criteria

- Eligibility to participate in NSF EPSCoR is based on the level of NSF research funding a state/jurisdiction receives
- Each year, the NSF EPSCoR office compiles summary data for the preceding three years of NSF research funding by State/Jurisdiction, excluding certain large centers or one-time expenditures
- States/Jurisdictions receiving 0.75% or less of the total are eligible to compete for EPSCoR funding
- 28 states, Guam, Puerto Rico and the Virgin Islands are currently eligible
  - Utah and Iowa became eligible in 2009
  - Missouri and Guam became eligible in 2012 and will be incorporated in the next DOE EPSCoR Funding Opportunity Announcement

# DOE EPSCoR Authorizing Legislation

## The Energy Policy Act of 1992, codified at 42 U.S.C. 13503(b)(3)(A).

- The Director of the Office of Energy Research shall operate an Experimental Program to Stimulate Competitive Research (in this paragraph referred to as 'EPSCoR') as part of the Department of Energy's University and Science Education Programs.
- The objectives of EPSCoR shall be--
  - (I) to enhance the competitiveness of the peer-review process within academic institutions in eligible States; and
  - (II) to increase the probability of long-term growth of competitive funding to investigators at institutions from eligible States.
  - (iii) In order to carry out the objectives stated in clause (ii), EPSCoR shall provide for activities which may include (but not be limited to) competitive research awards and graduate traineeships.
  - (iv) EPSCoR shall assist those States that--
    - (I) historically have received relatively little Federal research and development funding; and
    - (II) have demonstrated a commitment to develop their research bases and improve science and engineering research and education programs at their universities and colleges.

# DOE EPSCoR Program History

- Authorization 1992 (P. L. 102-486, Sec. 2203)
  - During the initial phase from FY91-FY94, DOE EPSCoR funded planning grants to give states experience in developing competitive proposals
- The DOE EPSCoR Program is managed to meet three main objectives:
  - To enhance the research capabilities of designated states
  - To conduct competitive energy-related research
  - To develop science and engineering manpower to meet current and future needs in energy-related areas
- Transition to Basic Energy Sciences FY1996 (H. Rpt. 109-275)
  - Increased focus on strengthening research capabilities relevant to energy research.
  - Program management at the same technical level as other BES programs
- EPSCoR State – National Laboratory Partnerships (FY 1998)
  - Innovative program to foster collaborative relationships with expertise at the DOE National Laboratories
- Participation in Office of Science Early Career Awards (FY 2011)

# Implementation Grants

- Goal is to enhance university research capabilities broadly
  - Coordinated research area of interest to state and DOE
  - Program coordination and human resource development closely coupled with research cluster
- Maximum funding of up to $2,500,000 per year for three years
  - One research cluster ( group of scientists working on a common theme) per application
  - One renewal for a maximum of six years of funding
- Other DOE Program Offices are requested to co-fund up to 10%
  - Concrete measure of program office relevance
  - Critical to success in transitioning research team to core programs for follow-up research funding

# Laboratory Partnership Grants

- Collaborative research with national laboratory required
  - Training of students and young faculty at the laboratory encouraged
  - Visit by Lab scientist to EPSCoR states also encouraged
  - No EPSCoR program funds go to the national laboratories
- Individual principal investigator originated
  - Research area of interest to DOE and states
  - One three-year grant per principal investigator, not renewable
  - Maximum funding $200,000 per year
- Nominal co-funding (up to 10%) by program offices requested

# Office of Science Early Career Awards

- DOE EPSCoR participates in the Office of Science Early Career Award process on a funds available basis
  - Consideration is limited to applications received from academic institutions in EPSCoR jurisdictions to the DOE Office of Science Early Career Award FOAs.
  - The DOE Program Area/Office may nominate meritorious applications that would not have been otherwise funded for joint funding consideration with DOE EPSCoR.
  - General information and investigator eligibility for the Early Career Award application process may be found at the Early Career Award website.
- DOE EPSCoR supports years 1-4 of the award
  - Year 5 support (20% co-funding) is to be provided by the partner DOE Program Area/Office to start transition to their competitive opportunities for future support.

# DOE EPSCoR Program Evolution

- Implementation Grants:
  - To improve proposal quality and further partnership with the EPSCoR states, only one application per state allowed (2003)
  - To enhance focus, research clusters per grant reduced to one (2006)
  - Historic funding level of up to $750,000 per year increased to $1,000,000 per year in FY 2009, increased again to $2,500,000 per year (by legislation) in FY 2011
  - Since 1996, the cumulative number of EPSCoR jurisdictions that have successfully competed for Implementation Grants has increased from six in FY 1997 to seventeen in FY 2005 and to twenty-four in FY 2011
- Laboratory Partnership Grants:
  - Maximum funding increased from $150,000 to $200,000 per year
- Reduced the State cost-sharing match to 0% (2009)
  - By request from the EPSCoR community

# Typical Funding Opportunity Announcements

- DOE EPSCoR Funding Opportunity Announcements are posted on a funds available basis
  - Implementation Grants
  - State-Laboratory Partnerships
  - Open to eligible states at the time of the FOA
- All applicants identify the DOE program to which their proposal is most closely related
- EPSCoR State/Jurisdiction chooses candidate for Implementation Award
- State/National Laboratory Partnership applications include EPSCoR State endorsement letters
- All proposals undergo peer review to determine the highest quality science

# Successful Projects Selected by Peer Review

- Standard Criteria used for all BES Grants
  1) Scientific and/or technical merit of the project
  2) Appropriateness of the proposed method or approach
  3) Competency of the personnel and adequacy of proposed resources
  4) Reasonableness and appropriateness of the proposed budget
- Additional EPSCoR Specific Criteria
  A) For Implementation Grants
     – Synergism among the PIs
     – Likelihood of success of the Implementation Award
  B) For EPSCoR State – National Laboratory Partnerships
     – Likelihood of success of the collaboration between the EPSCoR Applicant and the National Laboratory Partner

# EPSCOR Proposal Statistics

- Implementation Award Funding Opportunity Announcements
  - Success rate for new awards ~19% (FY2008-FY2011)
  - Success rate for renewals ~78% (FY2008-FY2011)
    - 1-year funding is typically provided to close-out awards that do not successfully renew

- EPSCoR State – National Laboratory Partnership Funding Opportunity Announcements
  - Success rate of ~27%

- In FY 2008-2011, 22 of the 29 EPSCoR states/jurisdictions received funding

# Current EPSCoR Portfolio (partial listing)

## Scattering & Instrumentation Sciences

- Growing the Neutron, X-ray and Electron/Scanning probe microscopies communities (U Tennessee-Egami, Kansas State-Edgar, U Wyoming-Lewis, Delaware-DeCamp, U Nebraska-Gruverman, U Tennessee-Camden, U Nevada Las Vegas-Cornelius)

## Condensed Matter & Materials Physics

- Nanoscale science/solar energy conversion (U Kentucky-Grulke, U Idaho-Rodriguez, U Oklahoma-Yang)

## Materials Discovery, Design & Synthesis

- Nanoscale science/solar energy conversion (U Kentucky-Grulke, U Wyoming-Parish)

## Chemical Transformations

- Nanoscale science/heavy oil conversion (U Oklahoma-Resasco)
- Biomass (U Maine-Pendse, U North Dakota-Seames)
- Fuel cells (U New Mexico-Atanassov, West Virginia U-Bajura)

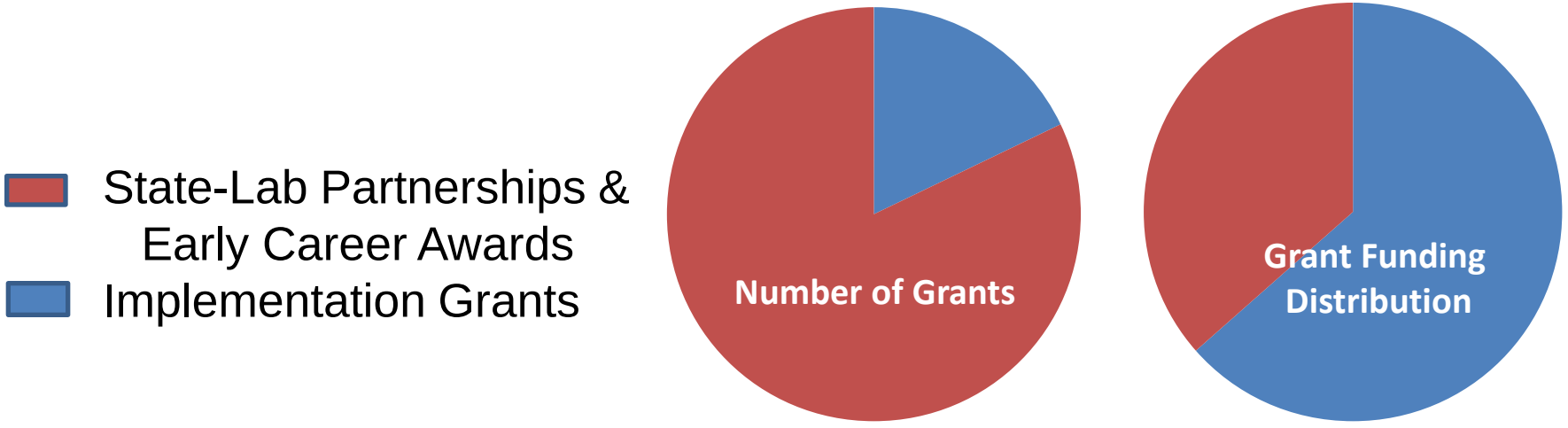
## Energy Technologies

- Energy storage (Brown U-Guduru, U Rhode Island-Lucht)
- Wind energy (U Alaska-Holdmann, U Wyoming-Naughton)
- Grid reliability (Montana State U-Nehrir)
- Nuclear Energy (Fission: Clemson-Ogale, U Tennessee-Grossbeck, U Idaho-Crepeau: Fusion: U New Hampshire-Bhattacharjee, U New Mexico-Lynn, West Virginia U-Scime)

# Funding Summary

| | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
|---|---|---|---|---|---|---|---|---|
| Total | 7,280 | 7,280 | 14,680[1] | 16,755[1] | 21,623[2] | 8,520 | 8,520 | 8,520[3] |

***[1] President's request was 8,240***
***[2] President's request was 8,520***
***[3] FY 2013 President's request***




**FY 2008 to FY2011: EPSCoR Portfolio Distribution between Implementation Grants and State-Laboratory Partnership Grants**

# EPSCoR Program Management Assessment

- 2006 – BES Committee of Visitors assessed the EPSCoR program
  - Recommended stronger monitoring of the Implementation Grants including use of performance metrics
- 2008 – DOE EPSCoR in coordination with the EPSCoR Interagency Coordinating Committee convened a Study Group
  - Recommended incorporation of performance evaluation metrics in the peer review process and increased use of site visits/reverse site visits to facilitate measurement of award efficacy
- 2009 – BES Committee of Visitors endorses Study Group recommendations
- 2009 – Funding Opportunity Announcement for Implementation Grants applies study group recommendations
- 2012 – BES Committee of Visitors (May 22-24, 2012)

# Added Review Criteria Detail for Implementation Grant Reviews

- The likelihood of success of the Implementation Award application including:
  - a) *Does the proposer have a plan to or has the awardee made competitive faculty hires and retained outstanding faculty within the scope of the implementation award?*
  - b) *Does the proposer have a plan to attract or has the awardee hired outstanding graduate students and post docs?*
  - c) *Does the proposer have plans to develop or have they developed as part of the implementation award unique infrastructure capabilities that are critical to the advancement of science or technology? Alternatively, are they planning to or making unique contributions to DOE oriented capabilities (e.g., building or developing unique capabilities for a DOE experiment or facility)?*
  - d) *Does the proposer have plans to be or are the grantees on track to a sustained leadership position in their discipline(s)?*
  - e) *Does the proposer have plans to or are the grantees effectively leveraging DOE funding and capabilities with local and regional resources? How has the jurisdictions EPSCoR Committee planned to and what actions have they taken to maximize the long-term impact of the award?*

# Program Assessment – Implementation Grant Site Visits

- **2009-2011**
  - 5 site visits with reviewers
  - 5 site visits without DOE reviewers (4 of these were in conjunction with meetings of the external advisory boards of Implementation Grants)
- **2012**
  - 2 site visits planned
  - 2 reverse site visits planned

# EPSCoR PIs/Co-PIs Successfully Compete for DOE-SC Core Research Funding (May be incomplete)

## State – National Laboratory Partnerships

(EPSCoR Support Dates) followed by program name & (support dates)

- Laurent Bellaiche, U Arkansas, (2004-2008); BES (2009-2012).
- Alberto Striolo, U Oklahoma (2009-2012); BES (2011-2014)
- Randall Headrick, U Vermont (2003-2007); BES (2011-2014)
- Alan Landers, Auburn U (2007-2010); BES (2011-2014)
- Jason Cassibry, U Alabama-Huntsville (2006-2009); Fusion Energy Sciences (2010-2012)
- Xincheng Xie, Oklahoma State (1999-2001); BES (2001-2004; 2010-2013).
- Ryszard Jankowiak, Kansas State (2008-2012); BES (2011-2014)
- Talat Rahman, Kansas State (1999-2001); BES(2000-2003, 2003-2008)– moved to Central Florida U
- Alexi Gruverman, U Nebraska (2010(7/1)-2013); BES (2010(9/1)-2013)
- Uwe Bunz, U South Carolina (2003-2005); moved to Georgia Tech & now grant co-PI BES(2010-2013)
- Dean Roddick, U Wyoming (2004-2008); BES (2008-2011)

## Implementation Awards (EPSCoR Support dates), (Program support dates)

- Madhu Menon, co-PI on Univ. Kentucky Grant (2007-present), BES (2009-2012).
- Vincente Guiseppe, co-PI on U South Dakota Grant (2010(7/1)-present), Nuclear Physics (2010(9/1)-2013)
- Kai Germaschewski, co-PI on Univ. New Hampshire Grant (2007-present) selected for DOE Early Career Award by Fusion Energy Sciences (2011-2016)

# Former EPSCoR State – National Laboratory Partnership PIs/Co-PIs Successfully Compete for Implementation Grants

- Daniel Resasco, U Oklahoma (1999-2002); BES (2005-2009); Biological & Environmental Research (2008-2012); Implementation Award (2010-present)
- Ram Katiyar, U Puerto Rico (2004-2008); Implementation Award (2008-2014).
- Terry Tritt, Clemson (2000-2003); Implementation Award (2004-2011)
- Satyanarayan Nandi, Oklahoma State (2000-2003); High Energy Physics (2001-2004; 2004-present); Implementation Award (2004-2011);
- Mark Hoffman, U North Dakota (2004-2008); co-PI on Implementation Award (2006-present)

# EPSCoR States Participated in the FY 2009 Energy Frontier Research Centers Competition

## Tackling Our Energy Challenges in a New Era of Science

- To engage the talents of the nation's researchers for the broad energy sciences
- To accelerate the scientific breakthroughs needed to create advanced energy technologies for the 21st century
- To pursue the fundamental understanding necessary to meet the global need for abundant, clean, and economical energy

**46 centers awarded ($777M over 5 years), representing 102 participating institutions in 36 states and D.C.**

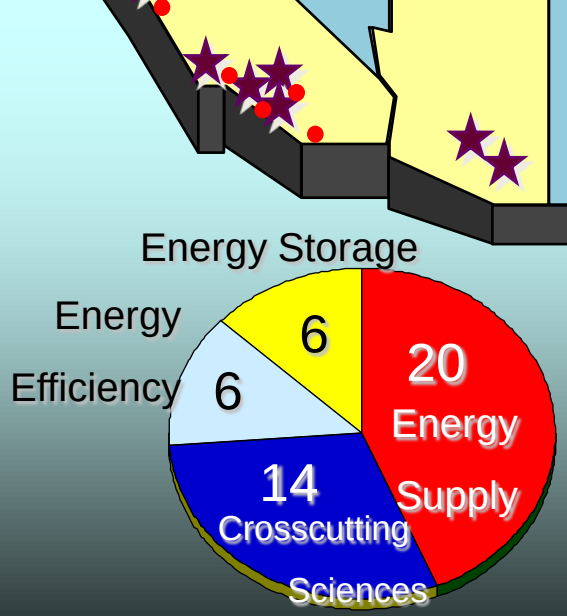
**Pursue *collaborative* basic research that addresses both energy challenges and science grand challenges in areas such as:**

- **Solar Energy Utilization**
- **Combustion**
- **Bio-Fuels**
- **Catalysis**
- **Energy Storage**
- **Solid State Lighting**
- **Geosciences for Energy Applications**
- **Superconductivity**
- **Advanced Nuclear Energy Systems**
- **Materials Under Extreme Environments**
- **Hydrogen**

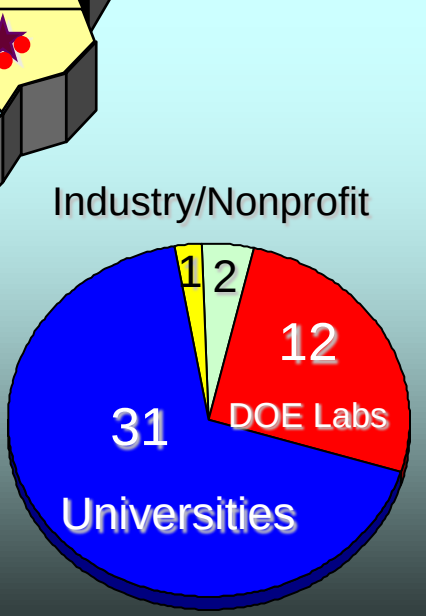
# EPSCOR States Participation in Energy Frontier Research Centers – about 20% of Institutions; 9 lead institutions

46 centers awarded, representing 102 participating institutions in 36 states plus D.C

Energy Frontier Research Center Locations ( ★ Leads; ● Participants)

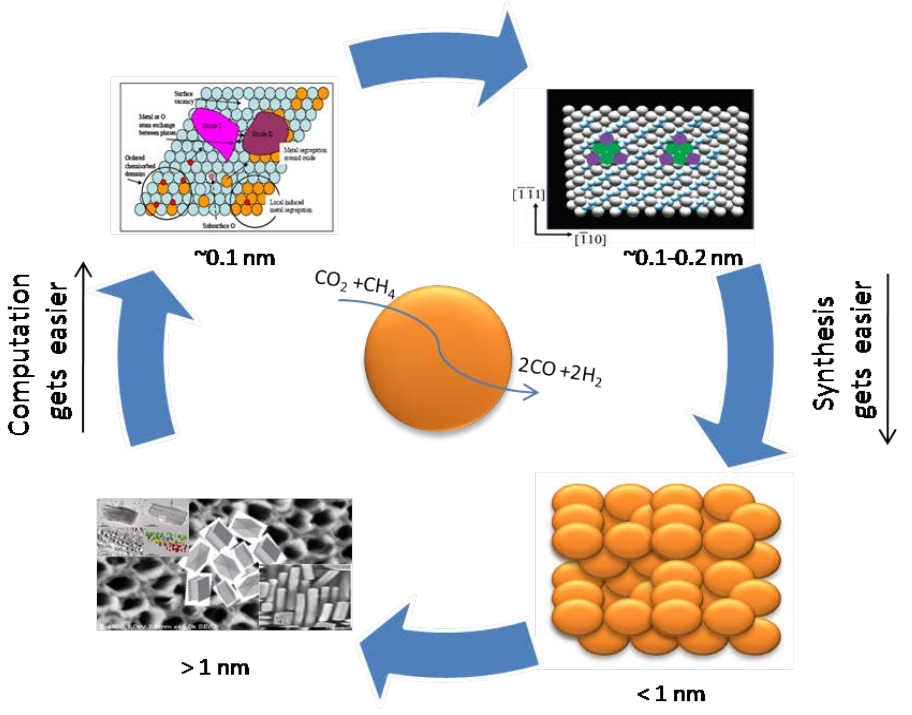



By Topical Category




By Lead Institution

**"Theoretical investigations guiding experimental research on surfaces"**

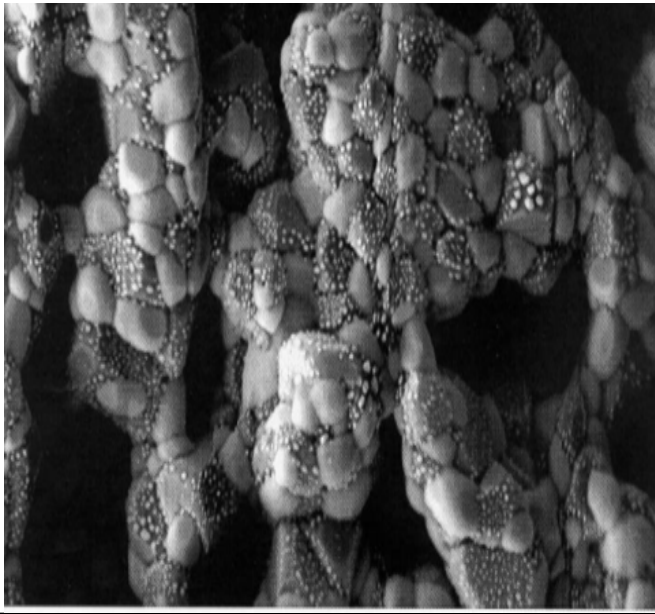



**RESEARCH PLAN AND DIRECTIONS**

**To develop next-generation computational and synthesis/characterization tools to engineer solid catalysts for energy-related conversion processes.**

# Heterogeneous Functional Materials Center
## Ken Reifsnider (University of South Carolina)

**The aim of this EFRC is to establish foundations of understanding and control science that enable the prescriptive design and ordered synthesis of the local compositions, interfaces, and morphology of heterogeneous material systems for specific functional behavior and system performance.**



## RESEARCH PLAN AND DIRECTIONS

***The greatest challenge to the creation of nano-synthesis concepts and processes that control nano-structural configurations and interfaces of active phases is to understand "what the picture should look like." We will use science to bridge the gap between multi-scale analysis and nano-synthesis methodologies to create new functional materials.***

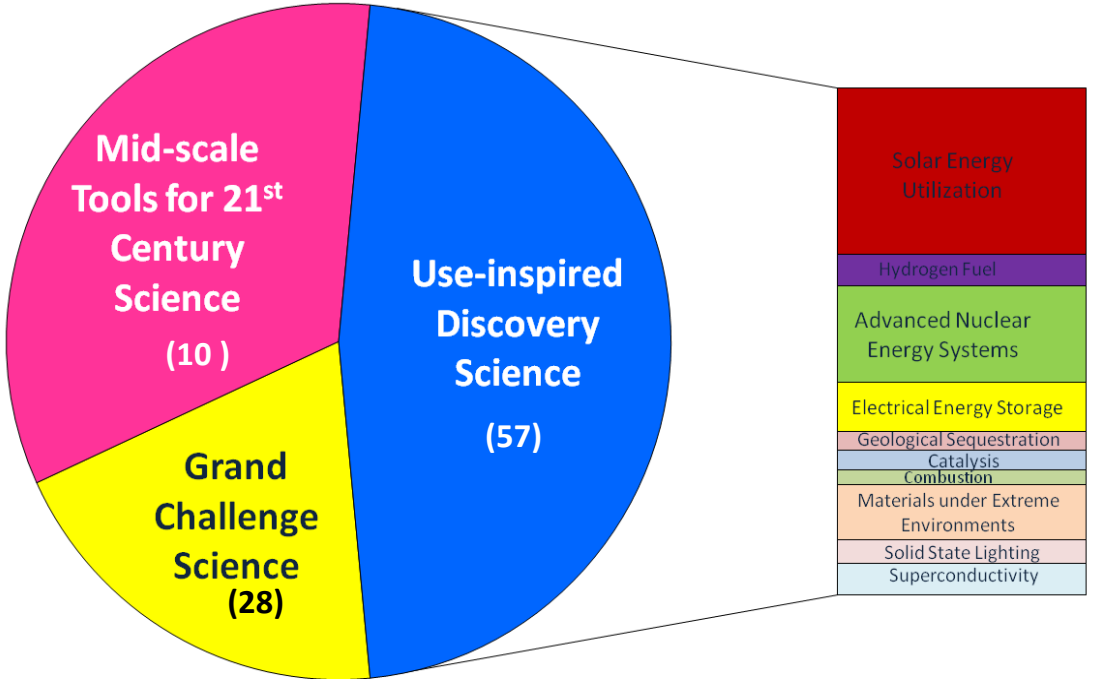
# About 15% of Single-Investigator & Small-Group Research Awards were to EPSCoR States

Grand challenge science: ultrafast science; chemical imaging, complex & emergent behavior

Use inspired discovery science: research areas identified in BESAC and BES workshop reports

Tools for 21st century science: midscale instrumentation

A total of $55M was awarded in FY 2009: single investigator awards ($150 – 300K/yr), small group awards ($500 – 1500K/yr) for up to three years, and mid-scale instrument (up to $2M).




95 projects were awarded:

- 72 university awards
  - 7 in EPSCoR States
- 23 lab awards
  - 6 in EPSCoR States

Grand challenge science: 22%

Use-inspired discovery science: 47%

Mid-scale tools: 33%

# DOE EPSCoR States Involvement

- For FY 2011, EPSCoR States/Territories received ~12% of the Office of Science University funding.
- Overall funding by the Office of Science to EPSCoR States/Territories was ~21% of the total Office of Science funding in FY2011.
- For FY 2011, EPSCoR States/Territories received ~20% of all DOE funds.
- All Office of Science Advisory Committees include representatives from EPSCoR States/Territories.
  - Representation is ~15%
- Recent workshops held by the Office of Basic Energy Sciences, EPSCoR State/Territory residents made up over 15% of the participants.

# Questions?