



EFRI Office Update

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NSF/ENG Advisory Committee Meeting
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THINK ENGINEERING

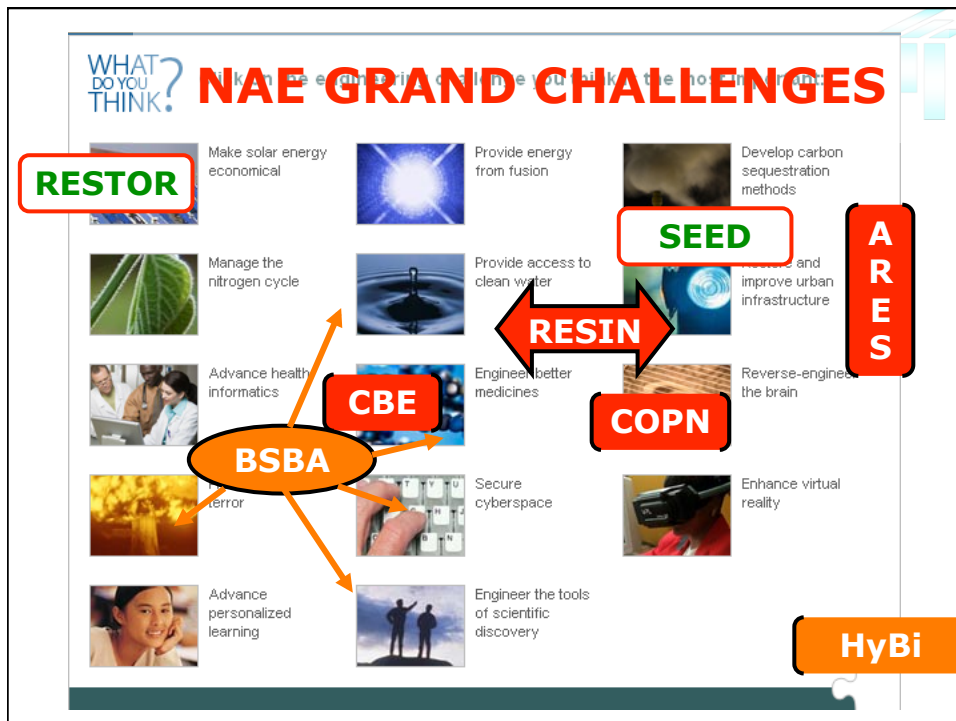


OUTLINE

- MOTIVATION – ENG Vision; NAE Grand Challenges
- EFRI Mandate, Criteria, Process
- Current EFRI Topics
- FY 2009 Solicitation Status
- FY 2010 EFRI TOPICS
- FY 2011 Plans
- Discussion Questions

Motivation: ENG VISION

NSF/ENG will be the global leader in advancing the frontiers of fundamental engineering research, stimulating innovation, and substantially strengthening engineering education.



EFRI Background



- **Office of Emerging Frontiers in Research and Innovation (EFRI) was established on October 1, 2006 as part of strategic planning and reorganization of Engineering Directorate of NSF*.**

www.nsf.gov/eng/general/reorg/

Purpose/Mandate of EFRI



EFRI will serve a critical role in helping the Directorate for Engineering focus on important emerging areas in a timely manner. EFRI will recommend annually a prioritization, fund, and monitor initiatives at the emerging frontier areas of engineering research and education.

Office of Emerging Frontiers in Research and Innovation

~Working Vision Statement~

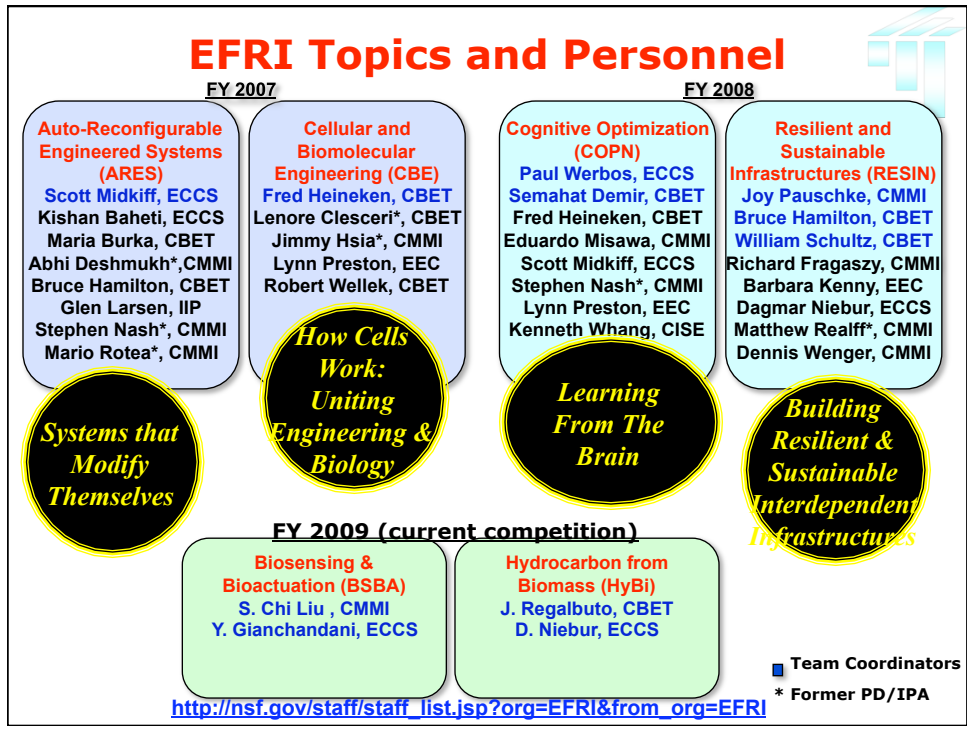
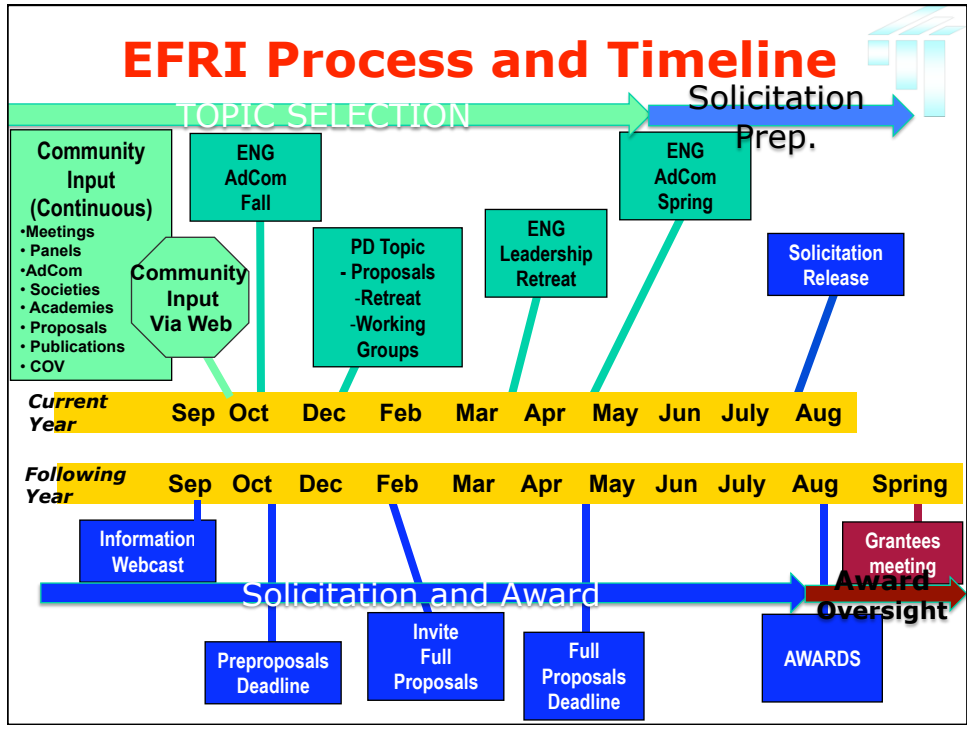
All NSF ENG Programs support research at the frontiers of research and innovation.

EFRI Office provides opportunities in interdisciplinary areas at the *emerging* frontiers of research and innovation that (a) are **transformative**, (b) address **national needs/grand challenges**, and (c) will make ENG unrivaled in its **global leadership**.

Post-EFRI Support Possible Routes

- Possible routes
 - ERC Program
 - New Program in a Division
 - Change/Restructure an existing Program
 - New Program at interface of Divisions
 - ➔ IDR opportunity

<http://nsf.gov/eng/general/IDR/index.jsp>





EFRI Grantee Meeting

- Latest Research Overviews at Grantee meetings website.
- Latest meeting held on March 5-6, 2009

<http://www.abecker.com/nsf/efri/grantees09>



FY 2009 Solicitation Status

- Released on September 2, 2008.
- **261 pre-proposals** were submitted on December 2nd, 2008.
- **81 were invited** to submit full proposal by April 30, 2009
- Plan to make a **minimum of 12 Awards** by September 2009.
(additional Awards may be made subject to ARRA funding availability.)



FY 2010 EFRI Topic Selection Outcome

- Issued DCL in August 2008.
- Held two Information Workshops for Research Community in September 2008.
- Community submitted 24 topic ideas.
- These were provided to all PDs for consideration in developing their "Frontier Idea" candidate topics.
- EFRI Topics selected do include some of the ideas submitted by the community.



FY 2010 Topic Candidates

- **Complex Systems : Fundamental knowledge for tackling societal grand challenges**
- **Renewable Energy Storage**
- **Science in Energy and Environmental Design Engineering Sustainable Buildings**

EFRI Topics Selected for FY 2010



1. Renewable Energy Storage (RESTOR)

2. Science in Energy and Environmental Design (SEED): Engineering Sustainable Buildings

RENEWABLE ENERGY STORAGE (RESTOR)



[Preliminary Ideas]

- **To seek transformative research from fundamentals to systems to design **large-scale storage** for renewable sources, such as solar and wind.**
- **Fundamental breakthrough research for large scale storage including**
 - **Employing new electrode materials capable of multi-electron transfer**
 - **Transport and reaction mechanisms**
 - **Interrelated mechanisms of electron and ion transfer influencing material decomposition and energy conversion processes**
- **CROSS-NSF AND INTERAGENCY COORDINATION-NSF/MPS and DOE**

RENEWABLE ENERGY STORAGE (RESTOR)



[Expected Transformative Benefits]

- Overcome a key barrier to broad utilization of renewable energy sources such as solar and wind
- New computational tools and intelligent systems to open up new paths for designing novel multifunctional materials with the desired physical and chemical properties
- Design of new nanostructures and metamaterials that enable high energy storage in compact form and can withstand extreme environmental conditions

Science in Energy and Environmental Design (SEED): Engineering Sustainable Buildings



[Preliminary Ideas]

- To understand how to **model and control**, in real-time, the critical flows (e.g., energy, heat, water, light, sound, air and occupants) through building materials and building spaces.
- To understand how do to **create new paradigms** for designing, constructing, operating, maintaining, and retiring buildings that will minimize fossil fuel consumption and adverse environmental effects.
- To enable **integrated multidisciplinary science, engineering and systems research** in areas of (1) Materials and Sensing, (2) Modeling and Simulation, and (3) Concepts for Autonomy and Interdependence.
- **INTERAGENCY COORDINATION- DOE, EPA, NIST**

Science in Energy and Environmental Design (SEED): Engineering Sustainable Buildings **[Expected Transformative Benefits]**

- To transform our engineering research to move the building industry towards a **science-based energy and environmental design** for engineering sustainable buildings.
- To transform the materials, devices and control systems used to produce, store and distribute **alternative energy in buildings**.
- To transform building systems design and management software to solve complex interacting-system problems with **interoperable, integrated, and user-friendly computational tools**.

Tentative Plans For FY 2011

- DCL – EFRI Topic Solicitation for FY 2011
 - Re-issue DCL earlier (by May 2009)
 - Re-enforce the opportunity to the ENG community– AdCom, Deans, Professional Society Executive Committees
- ENHANCE CROSS-DIRECTORATE/
INTERAGENCY INVOLVEMENT IN EFRI
- COV - EFRI Committee of Visitors is planned for late 2010/early 2011 (prior to Spring 2010 AdCom)
- EVALUATION - Plan to do an independent evaluation of EFRI awards and topics

Questions For Discussion



- **HOW TO ENGAGE MORE** – How to better engage community in EFRI topic selection?
 - FI WORKSHOPS? - Should we (seek and) provide funding for proposals/workshops to develop Frontier ideas?
- **CRITERIA YIN-YANG** - Transformative; National Need/Grand Challenges? Related: **NAE GCs Role?**
- **REPEAT TOPIC** - Should we allow previous EFRI topics re-compete in the following year or a subsequent one?
- **POST-EFRI:** How to ensure EFRI topics are affecting programmatic decisions within and between Divisions?
 - e.g. **RESIN** in **CMMI**
 - e.g. **CBE** and **HyBi** in **CBET**
 - **new ERC ideas**