Division of Electrical, Communications, and Cyber-Systems (ECCS)

Robert J. Trew
Division Director

ASEE ERC
ECCS Mission

- Address fundamental research issues at the nano, micro, and macro scales underlying device and component technologies (electronic and photonic devices), energy and power, controls, networks, communications, computation, and cyber technologies.

- Support integration of systems principles in complex engineering systems and networks for a variety of applications areas.

- Ensure education of a diverse workforce to meet the technological challenges of a 21st century global economy.
### Electrical, Communications, and Cyber Systems (ECCS)

**Division Director:** Robert Trew  
**Senior Engineering Advisor:** Lawrence Goldberg

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<th>Electronics, Photonics and Device Technologies (EPDT)</th>
<th>Integrative, Hybrid and Complex Systems (IHCS)</th>
<th>Power, Controls and Adaptive Networks (PCAN)</th>
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<td>(Open)</td>
<td>Rajinder Khosla</td>
<td>Radhakisan Baheti</td>
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<td>- Ultrafast Phenomena</td>
<td>- Biological &amp; medical devices</td>
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<td>Samir El-Ghazaly</td>
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<td>Electric Power Grids, including</td>
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<td>- Beyond Silicon CMOS;</td>
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<td>Pradeep Fulay</td>
<td>Andreas Weisshaar</td>
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<td>- Inter- and Intra-chip Communication/Network;</td>
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<td>Usha Varshney</td>
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<td>Devices and Systems</td>
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Funding Rates – Research Grants
ECCS, ENG, NSF

Proposals/Awards

ECCS Proposals
ECCS Awards
ECCS Funding Rate
ENG Funding Rate
NSF Funding Rate

0% 5% 10% 15% 20% 25% 30%

0 200 400 600 800 1000 1200 1400

2002 2003 2004 2005 2006 2007 2008 2009
Funding Rates – CAREER Awards
ECCS, ENG, NSF
An integrated national network of user facilities providing researchers open access to resources, instrumentation and expertise in all domains of nanoscale science, engineering, and technology

http://www.NNIN.org
Emerging Emphasis Areas for ECCS

- Nanoelectronics
  - SEBML
  - QISE
- Energy and Sustainability
  - Smart Grid
  - Photovoltaics
  - Alternate Energy
- Cyber-Physical Systems (CPS)
- Innovation Ecosystem
Science and Engineering Beyond Moore’s Law (SEBML)

- Doubling ENG support to $20 million for investigations into:
  - Devices
  - Systems and architecture
  - Multi-scale modeling and simulation research
  - Quantum information science and engineering
  - Design of efficient and sustainable manufacturing equipment, processes, and facilities
What’s a ‘smart grid’?
- Integrate information technologies with the electrical power infrastructure
  - Make use of the internet
  - Integrate computers and controllers in household heating/air conditioning units, appliances, etc.

Why?
- ‘Real time’ control of electrical consumption to balance load, optimize electrical energy use, and minimize loss and disruption, as well as cost
- Integration of alternate energy sources (e.g., photovoltaics, solar panels, wind generators, etc.)
- Enable ‘two-way’ power flow (two-way meters)

The Smart Grid is a *conservation* technology
A **cyber-physical system** (CPS) is a system featuring a tight combination of, and coordination between, the system’s computational and physical elements.

CPS originated from, but is now greater than, embedded systems.

- First generation embedded systems emphasized the computational elements, with less focus upon the strong link with the hardware.
- CPS emphasizes the network of interacting elements, rather than focusing upon stand alone elements.
CPS at NSF

- CPS at NSF is a joint program with strong collaboration between the CISE and ENG Directorates
  - CISE focuses upon the intelligent, computational, and networking aspects
  - ENG/ECCS focuses upon the integration and hardware aspects

- Budget
  - FY09: $45M, including $15M ARRA funds
  - FY10: anticipate between $30M to $34M