



CNST

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# Energy & Nanotechnology

Storage and the Grid



# The Energy & Environmental Systems Institute

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# The Energy & Environmental Systems Institute

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## *The Mission*

- Foster research & development that will satisfy growing global energy demand***
- Advance understanding of environmental and energy issues so as to contribute meaningfully to policy debate,***



# The Energy & Environmental Systems Institute

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## *Broad scope of*

- Research***
- Disciplines***
- Networks***



# The Energy & Environmental Systems Institute Research...

## EXPLORATION

### Seismic Imaging & Processing

Methods for depth-migration wide-aperture seismic data

Waveform tomography

Inverse problems, including large scale computer modeling

Seismic imaging and velocity analysis

Development of geodynamic modeling tools

Particle dynamics simulations of continental slope deformations



# The Energy & Environmental Systems Institute Research...

## PRODUCTION

### Enhanced Oil Recovery and Flow Assurance

Enhanced Oil Recovery using CO<sub>2</sub> – Foam mobility control

Reservoir sensors - NMR Well Logging

Emulsion flow and control

Asphaltene aggregation and deposition

Gas hydrates as flow assurance challenge

Theory and application of scale inhibitors - Brine chemistry



# The Energy & Environmental Systems Institute Research....

## Refining and Chemical Manufacturing

Complex fluid phase behavior & interfacial properties

Kinetics of fast reactions

Heterogenous catalysis

Computational fluid dynamics

Structure and nucleation of zeolites

NMR analysis of large compounds and mixtures

Membrane sensors

Protein modules for catalysis and biosensors

Thermostability of enzyme catalysts

Catalyst self-monitoring



# The Energy & Environmental Systems Institute Research...

## Emergent technologies & issues

Fuel cell membranes

Hydrogen Production

Solar Energy

Biofuels

Robotic systems & sensors

Global Carbon cycle

Methane emission mitigation techniques

Energy supply/demand modeling

Domestic and international energy policy analysis





# The Energy & Environmental Systems Institute Disciplines....



- ◆ **Maintaining an Interdisciplinary scope**
- EESI spans 6 schools
  - Engineering
  - Natural Sciences
  - Social Sciences
  - Architecture
  - Humanities
  - Management



## The Energy and Environmental Systems Institute Networks Internal.....

- ◆ Maintaining an Interdisciplinary scope...

### EESI's Affiliations within Rice

- Rice Energy Program
- Shell Center for Sustainability
- Center for the Study of Environment and Society
- Center for Biological and Environmental Nanotechnologies
- Brine Chemistry Consortium
- Processes in Porous Media Consortium



# The Energy & Environmental Systems Institute Networks External.....



## ◆ Forming Alliances with

Local Energy Leaders (examples)

- ❑ Houston Energy Collaborative
- ❑ Greater Houston Partnership
- ❑ UT BEG FutureGen Efforts

Leading Global Centers (examples)

- ❑ NANKAI (China)
- ❑ CEREGE (France)