

AEC

ADVANCED ENERGY CONSORTIUM

Advanced Energy Consortium (AEC)

Bureau of Economic Geology

Jackson School of Geosciences
The University of Texas at Austin



Outline

- **What is the Advanced Energy Consortium ?**
- **Why are advanced sensors necessary?**
- **Next Steps?**
- **Contacts**

Advanced Energy Consortium (AEC)

The AEC is a multimillion-dollar research consortium dedicated to the development of subsurface micro- and nanosensors that can help characterize the reservoir rock formation and its contents in three dimensional space.

AEC intends to act as a hub for collaborative research and technology networking with aims of bringing together the best scientists and engineers from industrial organizations and academic institutions around the world—all with the shared vision of delivering technologies that will illuminate oil and gas reservoirs in order to enable the most effective extraction and production from existing resources.

The goal is to provide a secure, sustainable, and affordable energy supply for this and future generations.



History of the Advanced Energy Consortium

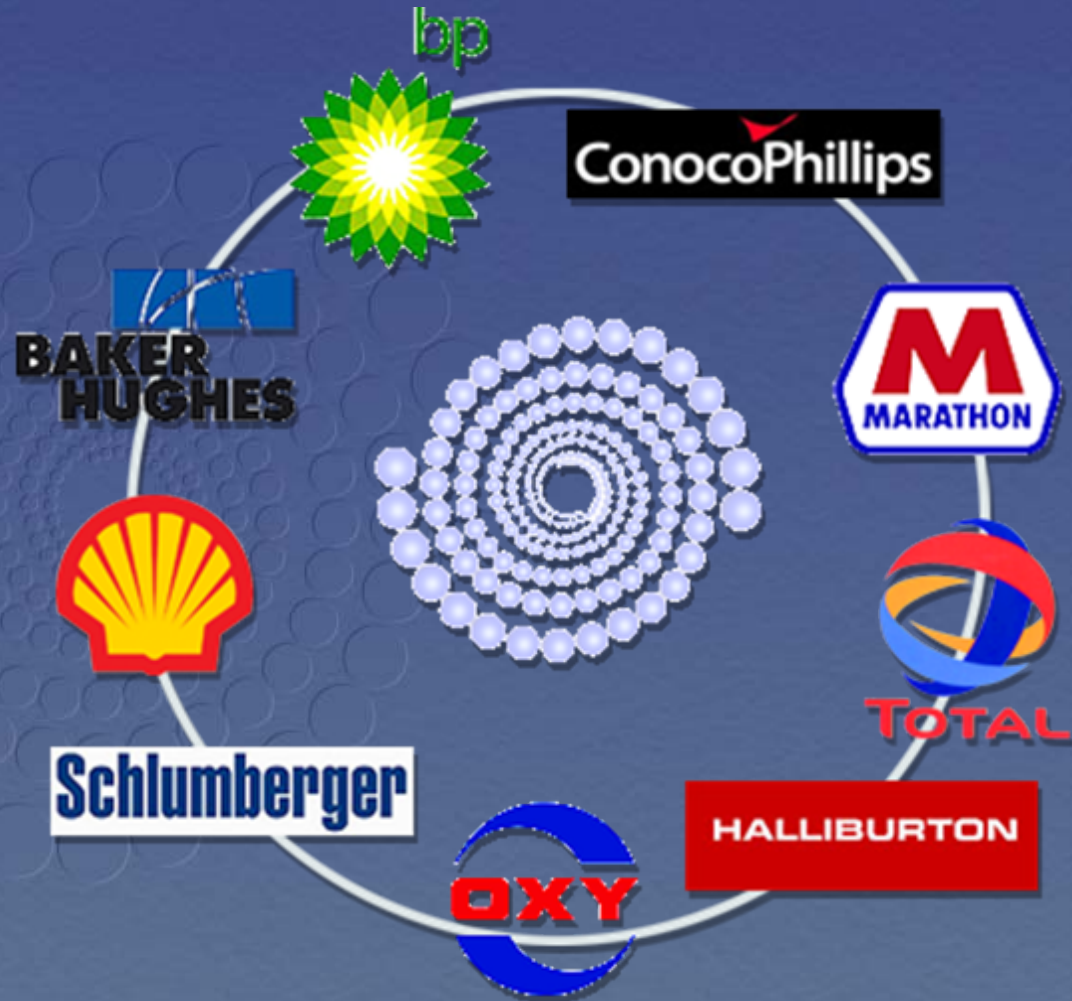
- AEC was in development for three years
- Developed by Bureau of Economic Geology with executive level member company support
- Secured Anti-Trust approval for consortium from Dept of Justice in August 2007
- Opened doors 1 Jan 08
- Held 1st pre-solicitation workshop May 2008
- Issued Request for Proposals on 14 July 08

Factors Leading to AEC Formation

- Energy industry research continues to trend towards **applied**
- Strong need for “**disruptive**” advances in research and technology development
- Belief that advances in **semiconductor, nanotech, and biotech** can be applied to the energy industry

Membership

- BP
- BakerHughes
- ConocoPhillips
- Halliburton
- Marathon
- Occidental
- Schlumberger
- Shell
- Total



AEC Governance

- Initial limit of ten companies
 - \$1 million/company/year
 - 3 year commitment
 - 2 year rolling commitment
- Bureau of Economic Geology manages consortium
- Rice University is a technical partner
- Member technical team directs research focus
- Board of Management approves
- Funding \$6-7M in research by YE2008

Operations

- **Low overhead (leverage UT and BEG)**
- **Collaborations**
 - Universities
 - National Laboratories
 - Private Companies
 - Research groups/labs like SEMATECH/SVTC
 - State of Texas
- **Focused and Efficient**
 - Fund research through external grants
 - Use DARPA-like proposal/grant process

Mission

The AEC will investigate how pre-competitive research in micro- and nanotechnology, with an initial emphasis on sensors and materials, can create a positive disruptive change in the upstream oil & gas industry.

Research Focus

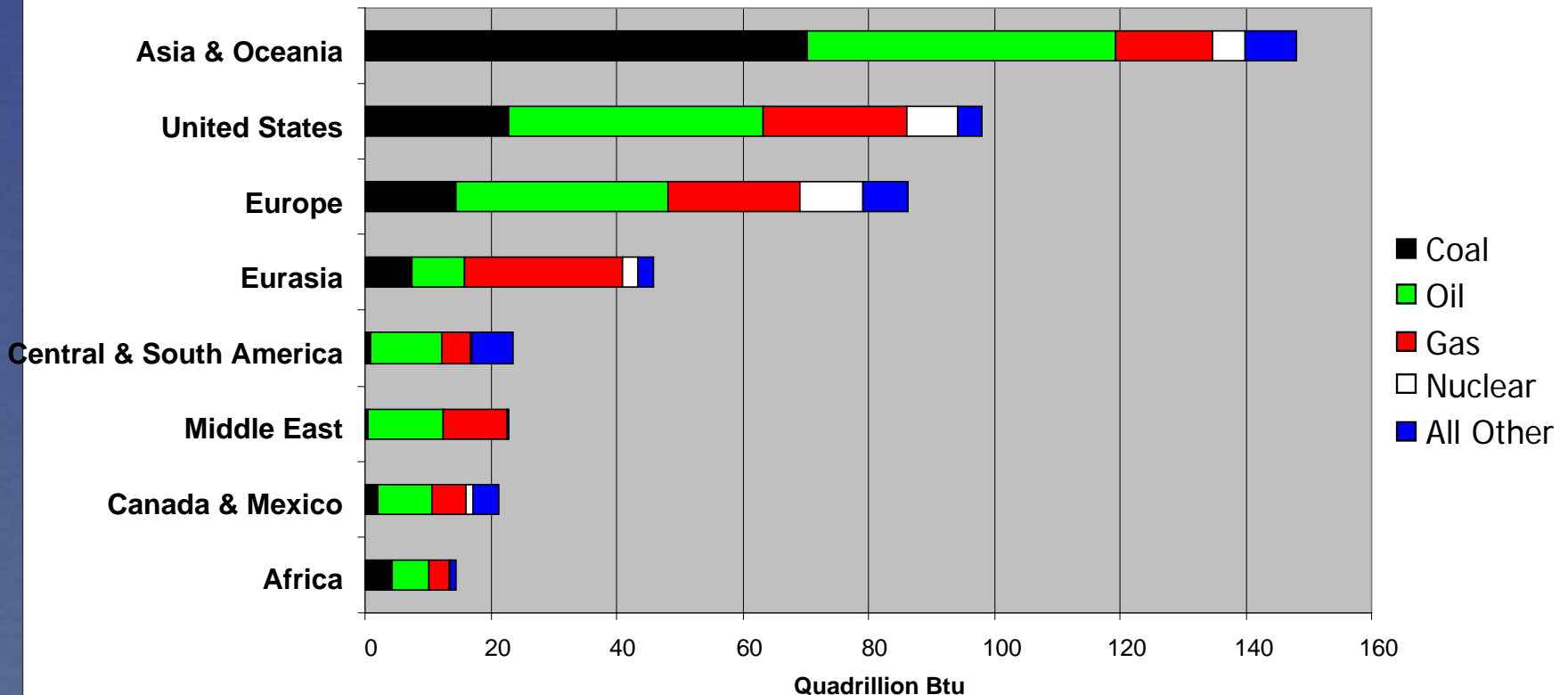
- Nano Sensors
 - Primary focus – with long development time
 - Research efforts will have to address communication, power, sensing, deployment and construction requirements
- Nano Material
 - Secondary focus, with nearer-term potential
 - Plan evaluation of the opportunities
 - Leverage existing and new materials under development for other areas (health, medical, security)

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Current Global Energy Usage

Energy Use (Quadrillion Btu)



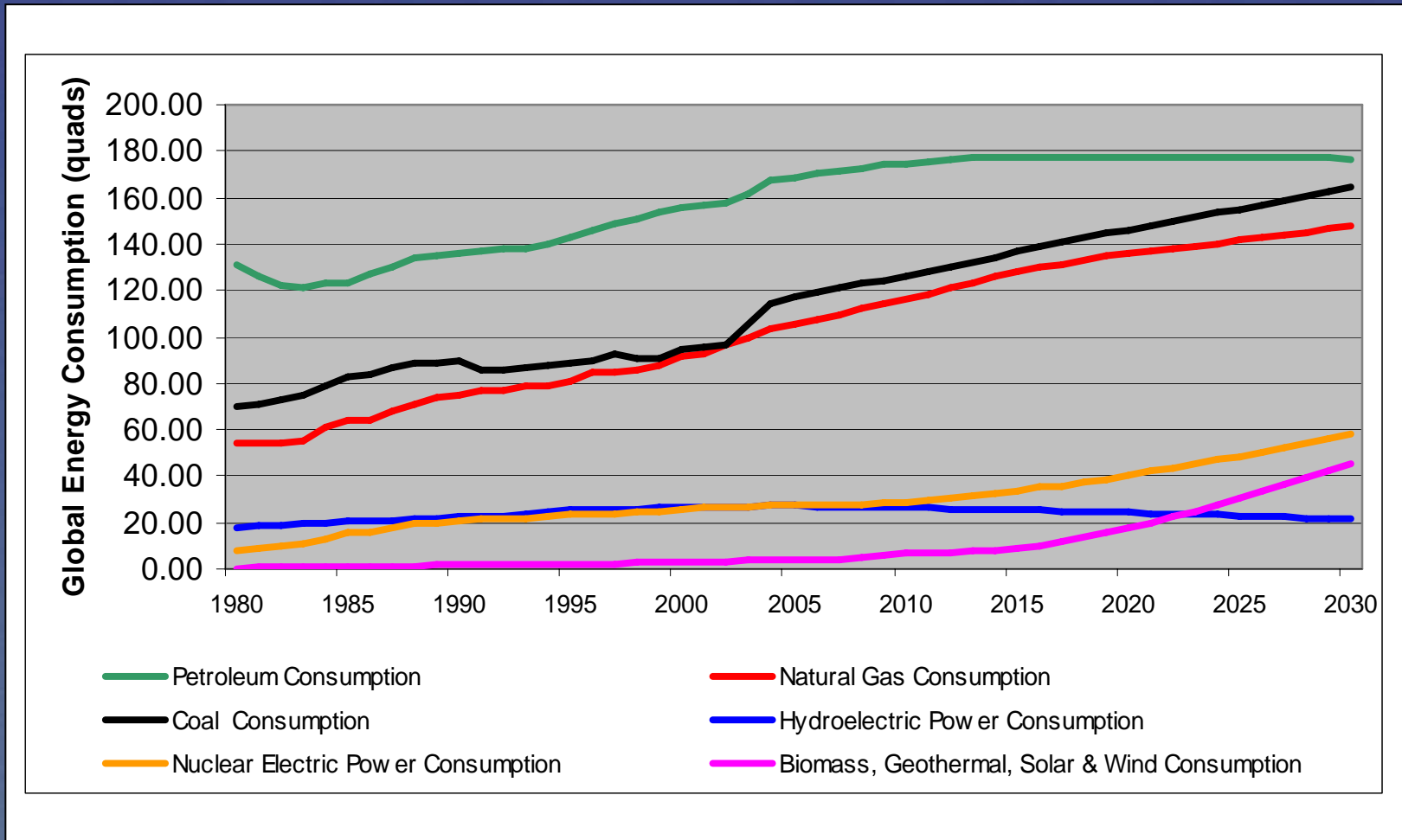
Data: EIA, October 2007

Tinker, AAPG Pacific Section, 2008

We depend upon fossil fuels today.



Despite increased use of renewables



Historical Data: EIA October 2007

Forecasts: Tinker, 2008

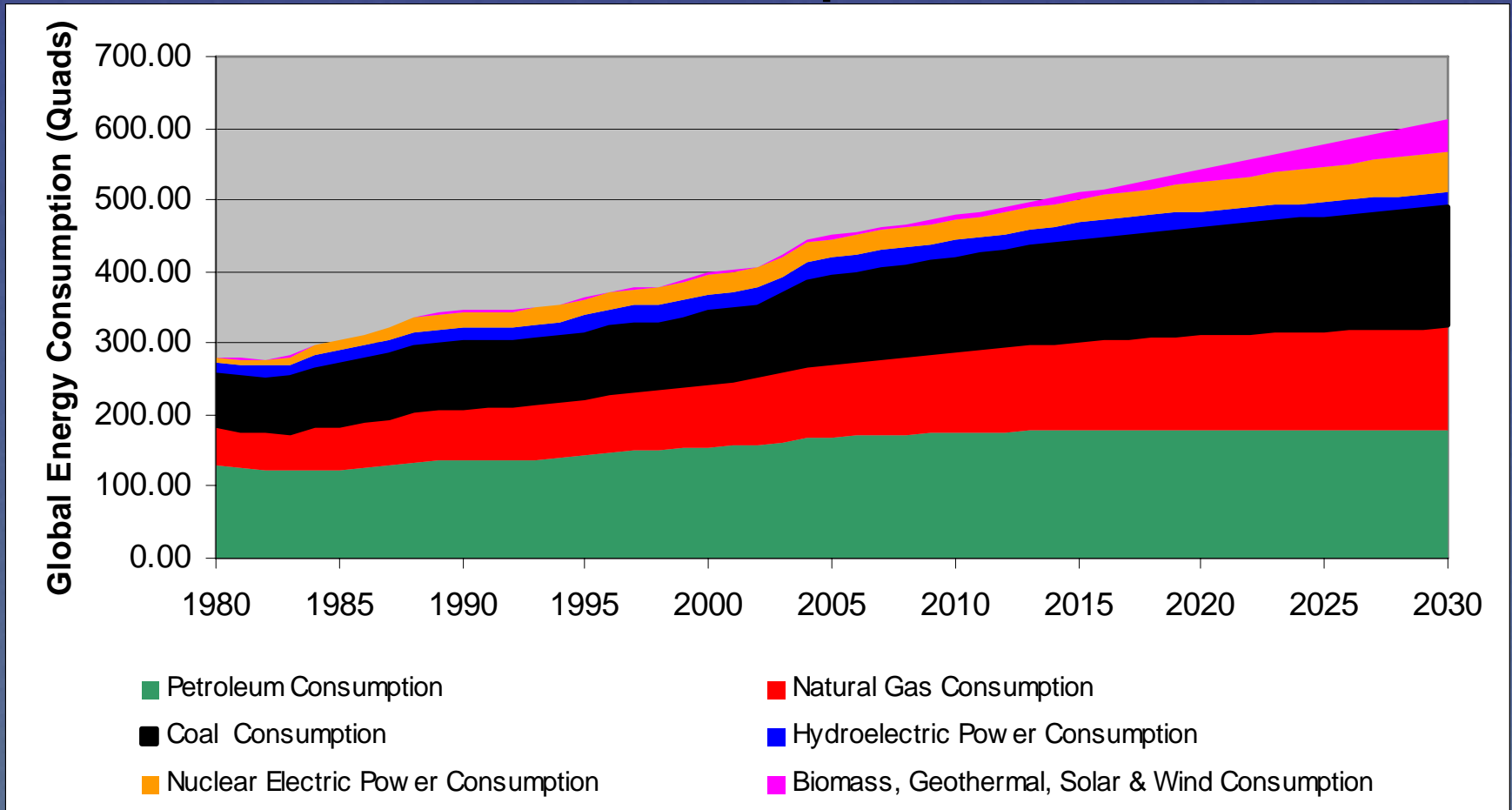
Tinker, AAPG Pacific Section 2008



We will continue to depend upon fossil fuels tomorrow.

ADVANCED ENERGY CONSORTIUM

Even optimistic forecasts suggest fossil fuels still required . . .



Tinker, AAPG Pacific Section 2008

Historical Data: EIA October 2007
Forecasts: Tinker, 2008



And Despite Use of Sophisticated Enhanced Oil Recovery Methods

- **Water Floods**
 - high permeability fields
- **Chemical Floods**
 - high permeability fields, use peaked in 1980's
- **Miscible Gas Injections**
 - low permeability fields
 - primarily CO₂, some N₂
- **Thermal recovery (steam)**
 - highly porous & permeable reservoirs, very viscous oil, shallow
 - 90% TEOR limited to Kern County, California

Significant amount of oil may yet be unrecovered !

US Technically Recoverable Resource Potential

Basins / Area	No. Large Reservoirs Assessed	All reservoirs (Ten areas Assessed)		
		OOIP* (Billions Barrels)	ROIP** (Billions Barrels)	Technically Recoverable*** (Billions Barrels)
Alaska	34	67.3	45.0	12.4
California	172	83.3	57.3	5.2
Gulf Coast	239	44.4	27.5	6.9
Mid-Continent	222	89.6	65.6	11.8
Illinois & Michigan	154	17.8	11.5	1.5
Permian	207	95.4	61.7	20.8
Rocky Mountains	162	33.6	22.6	4.2
Texas: East & Central	199	109.0	73.6	17.3
Williston	93	13.2	9.4	2.7
Louisiana Offshore	99	28.1	15.7	5.0
Total	1581	581.7	390.0	88.7

67%

- * OOIP=orig. oil in place
- ** ROIP=remaining oil in place
- *** Using current (EOR) tech

Source: DOE, Feb. 2006



Inter-well Data

- Reservoir-scale tools are good at measuring matrix properties in the near-well bore environment ($\leq 1\text{m}$)
- Because we are unable to measure interwell matrix and fracture properties, we rely on approximations
- In most cases, we lack the ability to monitor the inter-well changes in fluid properties that occur as the reservoir is developed and produced ($\geq 1\text{m}$ to km_s)
- With greater knowledge of the matrix, fracture, and fluid properties, and production-related changes, our ability to increase recovery rates will improve
- **Nanoscale sensors have the potential to provide inter-well data**

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2008 Time Line

Official Start of AEC	1 Jan 08
Press Release Announcing AEC	15 Jan 08
Pre-Solicitation Workshop	20-21 May 08
Issued RFP (5 page)	14 July 08
Deadline for preproposals	20 Aug 08
Invite Final Proposals (Detailed)	22 Sept 08
Deadline for final proposals	20 Oct 08
Announce selections	3 Dec 08
Finalize contracts	December 08
Start projects	January 2009



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AEC Contacts

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