Addressing Common Subsurface Challenges

Mastering the subsurface for energy production and storage and for the management of energy waste streams constitutes an energy “grand challenge.” To meet this challenge, the Department of Energy (DOE) is implementing a new collaborative model to address the following common subsurface challenges:

1. Discovering, Characterizing, and Predicting
   - accurately characterizing the subsurface using integrated geophysical and geochemical technologies
   - quantitatively inferring subsurface evolution under current and future engineered conditions
   - finding viable, low-risk resources

2. Accessing
   - safe, cost-effective reservoir integrity

3. Engineering
   - creating/constructing desired subsurface conditions in challenging high-pressure/high-temperature environments

4. Sustaining
   - maintaining optimal subsurface conditions over multi-decadal or longer time frames through complex system evolution

5. Monitoring
   - improving observational methods to advance the understanding of multi-scale complexities through system lifetimes

Why is the SubTER Crosscut Important?

Subsurface energy sources satisfy over 80% of total U.S. energy needs. Finding and effectively exploiting these resources while mitigating impacts of their use constitute major technical and socio-political challenges. Still, the opportunities are vast. Next generation advances in subsurface technologies will enable increases in domestic natural gas supplies, as well as 100+ GWe of clean, renewable geothermal energy. The subsurface provides hundreds of years of safe storage capacity for carbon dioxide (CO₂), and opportunities for environmentally responsible management and disposal of hazardous materials and other energy waste streams. The subsurface can also serve as a reservoir for energy storage for power produced from intermittent generation sources. These opportunities have immediate connection to societal needs and administration priorities. Clean energy deployment and CO₂ storage are critical components of the President’s Climate Action Plan, necessary to meet the 2050 greenhouse gas (GHG) emissions reduction target. Increasing domestic energy supply from greater hydrocarbon resource recovery, in a sustainable and environmentally sound manner, is also an Administration goal that enhances national security and fuels economic growth.

Who’s Involved?

Representing the geosciences, research, modeling, technology development, policy, and stakeholders, the participating DOE program and staff offices include:

- Fossil Energy
- Energy Efficiency & Renewable Energy
- Nuclear Energy
- Environmental Management
- Science
- ARPA-E
- Electricity Delivery & Energy Reliability
- Energy Policy & Systems Analysis
- Congressional & Intergovernmental Affairs
- Energy Information Administration

Learn more about SubTER at www.energy.gov/subsurface-tech-team.
Crosscutting RD&D Strategy

Through ongoing engagement with key stakeholders to help identify high priority technology areas for federal advancement, DOE has developed a comprehensive RD&D strategy focused around four core pillars:

**Intelligent Wellbores** – New sensors and adaptive materials are needed to ensure sustained integrity of the wellbore environment.

**Subsurface Stress & Induced Seismicity** – Radically new approaches are needed to guide and optimize sustainable energy strategies and reduce the risks associated with subsurface injection.

**Permeability Manipulation** – Greater knowledge of coupled processes will lead to improved methods of enhancing, impeding, and eliminating fluid flow.

**New Subsurface Signals** – DOE seeks to transform our ability to characterize subsurface systems by focusing on four areas of research: new signals, integration of multiple data sets, identification of critical system transitions, and automation.

A critical component of all pillars will be R&D testing at Energy Field Observatories. Field tests are critical to the validation of new results and approaches at commercial scale to validate tools, technologies, and methodologies and measure progress.

Events

**UPCOMING**

- **DOE Crosscutting Subsurface Initiative:** Adaptive Control of Subsurface Fractures and Flow Town Hall, December 15, 2014, 6:15-7:15 pm American Geophysical Union Fall Meeting San Francisco, CA

- **Informational Briefing on Subsurface Technology and Engineering Challenges and R&D Opportunities:** Stress State and Induced Seismicity Public workshop hosted by the United States Energy Association, October 30, 2014, Washington, DC

- **National Research Council Joint Committee Meeting:** Critical Issues in the Subsurface: Using Field Observatories and Data to Advance Understanding of Rock Behavior October 23, 2014, Washington, DC

**PAST**


- **National Research Council Committee on Geological and Geotechnical Engineering Meeting:** May 29, 2014, Washington, DC https://dels.nas.edu/global/bes/COGGE-Events

- **SubTER Workshop with National Lab Partners:** March 14, 2014, Washington, DC