



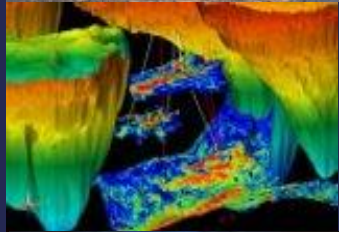
Sandia
National
Laboratories

Exceptional service in the national interest

Geosciences capabilities



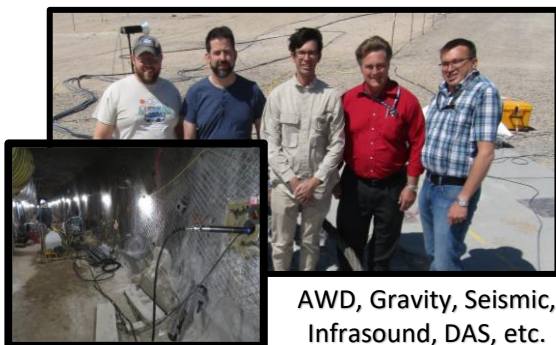
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SAND 2018-4900 PE



SAND2023-14533PE

Geophysics capabilities

Fielding & Site Characterization

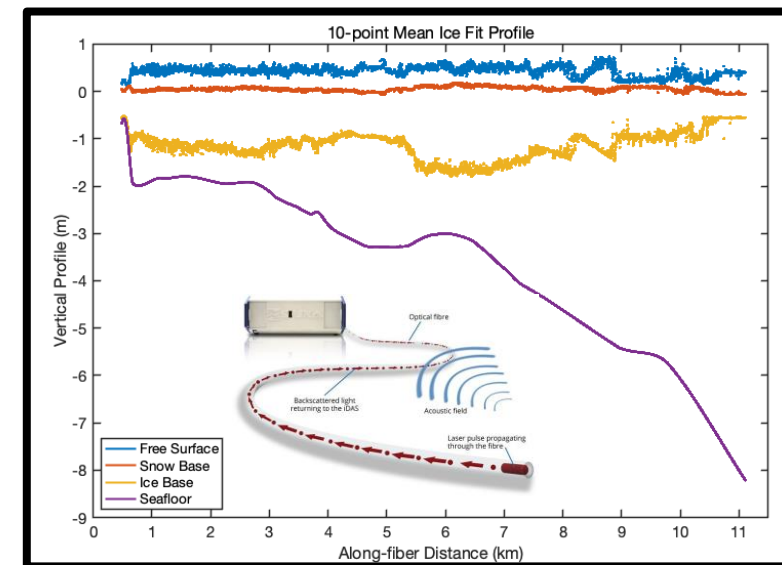


AWD, Gravity, Seismic, Infrasound, DAS, etc.

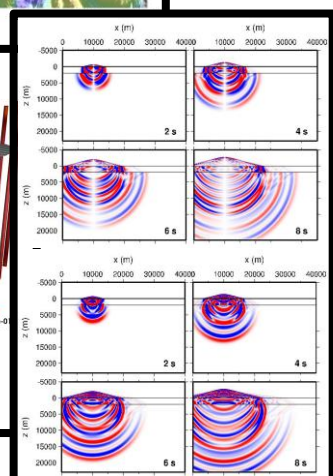
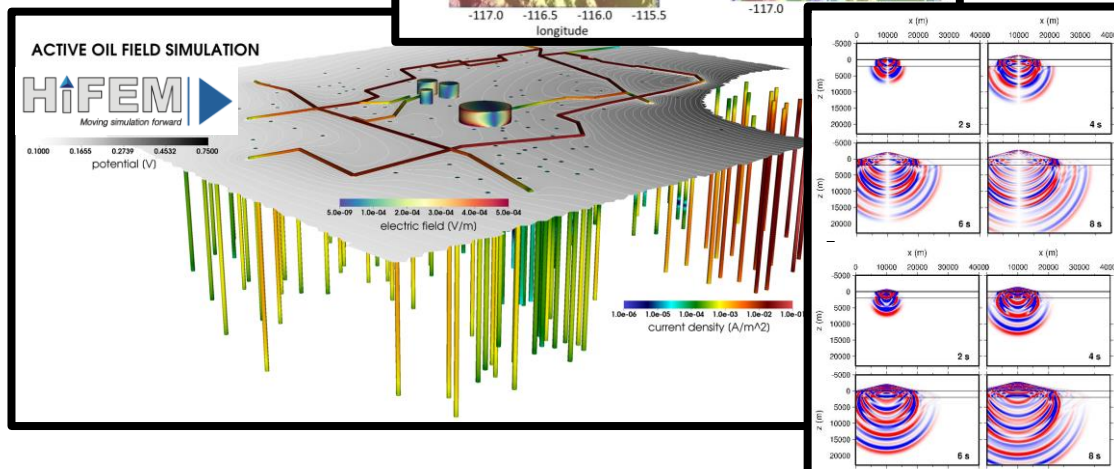
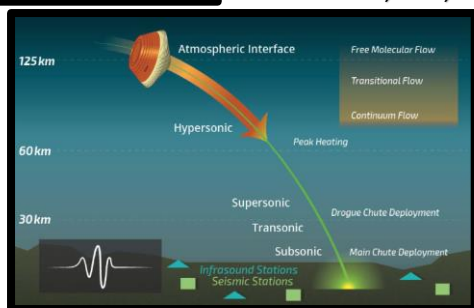
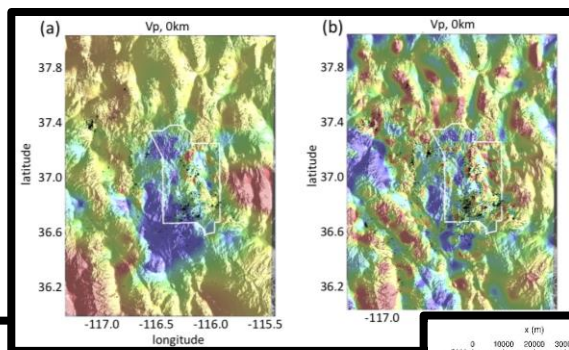
Near Surface & Active Source



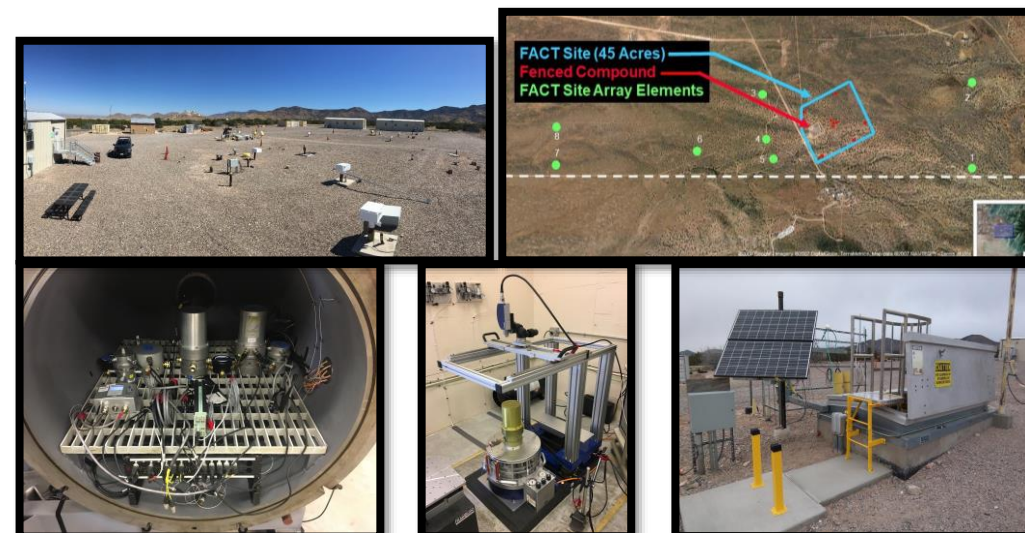
Distributed Acoustic Sensing



Computational Modeling



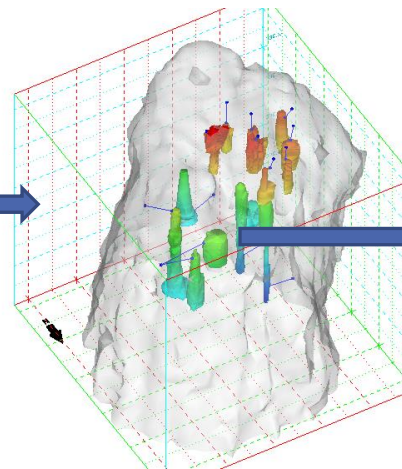
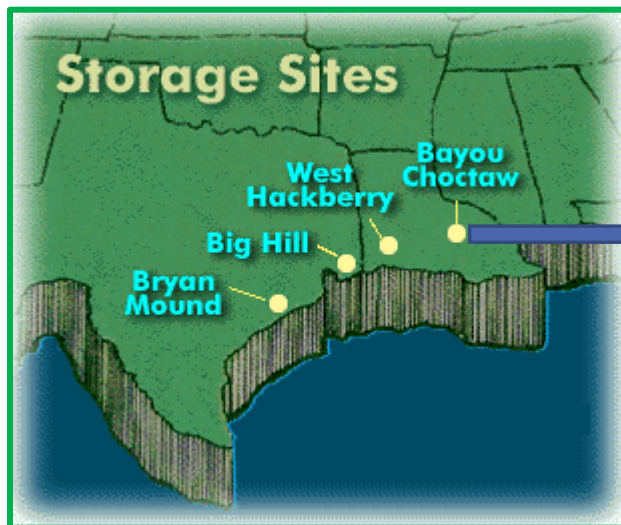
Facility for Acceptance, Calibration, & Testing (FACT) Site



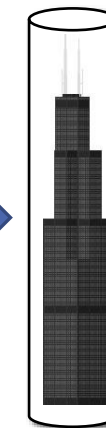
U.S. Strategic Petroleum Reserve: What is it?



- Stockpile of government owned emergency crude oil
- To be drawn down, by presidential order, during a disruption in commercial oil supplies that impact the U.S. economy.
- Must have a drawdown capability of 4.4 million barrels a day up to 90 days.
- Time for oil to enter U.S. market is 13 days from presidential decision.



200 ft



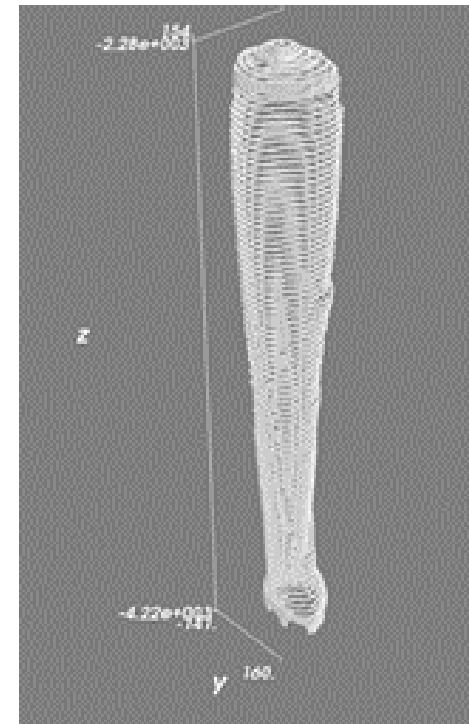
2000 ft

- 62 caverns
- 727 MMB oil

U.S. Strategic Petroleum Reserve: Sandia's role

Geotechnical advisor to the SPR-since 1979

- Site Characterization Studies
- Full Cavern/Well Design and Development
- Cavern Mechanics Analyses
- Cavern Operational Analyses
- Cavern Integrity Testing
- Well Integrity Test
- Subsidence Modeling
- Monitoring Technology



Impact: Work feeds directly into ensuring all 4 sites are drawdown capable/ready.

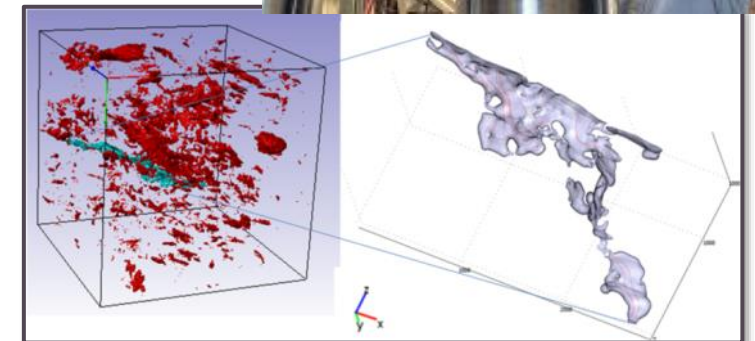
Geomechanics capabilities

Applying science & engineering principles to solve complex coupled-processes inherent with geologic and engineered materials:

- Laboratory testing
- Constitutive model development
- Numerical simulation
- Bench-scale & field-scale validation

Geomechanics laboratory focused capabilities of material testing:

- Confined experiments under pressure and temperature
- Creep (slow strain rate) testing of materials
- Permeability testing at geological relevant conditions and fluids (Hydrogen, CO₂, brine, etc.)
- Broad range of material characterization from microscope to bulk properties



Geochemistry capabilities

Wide range of experimental capabilities:

- High temperature-pressure reaction experiments
- Controlled atmosphere oxidation-reduction chemistry experiments
- In situ characterization, including temperature-controlled UV-visible and Raman investigations

Knowledge and expertise:

- Reactions at air-mineral-water interfaces
- Mineral alteration during hydrofracturing and subsurface storage of CO₂ and H₂
- Chemistry under nano-scale confinement
- Chemical characterization of kerogen and its hosted shale
- Chemical effects on fracture
- Environmental behavior of stable isotopes
- Machine learning assisted microspectroscopic image analysis
- Material property characterization using gas adsorption & desorption



TGA



Anaerobic glovebox

Geothermal capabilities

Developing downhole tools for geothermal, oil and gas, environmental restoration, mine rescue, energy storage, and national security missions.



Drilling technologies

- Investigating new drilling processes and tools to make geothermal energy practical and affordable

Downhole electronics & tool development

- Development and evaluation of high temp, high pressure, harsh environment downhole tools



Energetic stimulation

- Development of innovative stimulation technologies
- Operating a drilling and stimulation test site

Wellbore integrity

- Understanding of wellbore failure mechanism
- Development of monitoring techniques, evaluation tools, remediation technologies

Computational modeling

- Understanding and predicting geothermal system performance using advanced numerical methods and high-performance computing

