Unconventional Oil and Gas Project Selections

The Office of Fossil Energy's National Energy Technology Laboratory's unconventional oil and gas program is devoted to research in this important area of energy development. The laboratory partners with industry and academia through cost-sharing agreements to develop scientific knowledge and advance technologies that can improve the environmental performance of unconventional resource development. Seven new projects selected in the fall of 2013 hold the promise to improve extraction of unconventional resources while protecting the environment.

Evaluating Rocks and Fluids During Fracturing — GroundMetrics Inc. (San Diego, Calif.) will work with Global Microseismic Services to conduct the first electromagnetic data collection during a commercial horizontal well hydraulic fracture using an innovative new depth-to-surface electromagnetic method. This project will evaluate rock properties and how fracture fluids spread or disseminate. (DOE funding: $1,875,759; cost share: $583,333; duration: 20 months)

Testing Smart Concrete — Cementing is crucial during the construction of oil and natural gas wellbores to isolate fluids within the wellbore from surrounding groundwater resources. Oceanit Laboratories Inc. (Honolulu, Hawaii) is partnering with several operating companies to test Nanite™ — a proprietary concrete that is highly durable, "smart," and multifunctional. This research will help determine Nanite's ability to (1) provide information on the integrity of cement barriers; (2) identify and measure the stress on casing, cement shrinkage, and well conditions throughout the life of the well; and (3) monitor the infiltration of gas, mud, and various fluids into the cement. (DOE funding: $1,200,000; cost share: $300,000; duration: 36 months)

Assessing the Environmental Benefits of Replacing Diesel-Powered Engines — West Virginia University Research Corporation (Morgantown, W.Va.) will partner with Halliburton Corporation, Hypercat Advanced Catalytic Products, and FYDA Energy Solutions to assess and characterize improvements in air quality when natural gas or dual-fuel (natural gas and diesel) engines replace diesel-powered units during hydraulic fracturing operations. (DOE funding: $1,492,128; cost share: $407,304; duration: 24 months)

Stabilizing Foams for Hydraulic Fracturing — Using stable foams in place of water as the fracturing fluid during hydraulic fracturing could reduce or eliminate the amount of water needed for the process, as well as provide other environmental benefits. The University of Texas at Austin will develop a new method of stabilizing foams for hydraulic fracturing through a surface-coated nanoparticles technique. These surface-coated nanoparticles can be mixed with carbon dioxide, nitrogen, or liquefied petroleum gas to generate stabilized foams for use as a fracturing fluid, helping to alleviate one of the challenges for domestic hydrocarbon production. (DOE funding: $1,089,662; cost share: $272,506; duration: 36 months)

Measuring Methane and Other Emissions — The boom in production of natural gas from the Marcellus and other shale formations has raised concerns about the release of methane emissions that contribute to climate change. Carnegie Mellon University (Pittsburgh, Pa.) will measure the leakage rates of methane, ozone-forming volatile organic compounds, and other pollutants from Marcellus shale development. Measurements will also be conducted to quantify methane

emission rates from non-shale gas sources in the Marcellus area for comparison, including active and abandoned conventional gas wells and coal mines, agriculture and livestock, and landfills. The resulting data can be used in lifecycle analyses, chemical transport models, and policy decision-making. (DOE funding: $1,001,990; cost share: $250,498; duration: 36 months).

In a related project, the Pennsylvania State University (University Park, Pa.) will measure emissions of methane gas continuously over a 2-year period from a 10,000-square-kilometer portion of a Marcellus shale region in north-central Pennsylvania. Four tower-based sensors, as well as automobiles and aircraft, will be used to make these atmospheric measurements. The project will also include a regional inventory of other methane sources, including landfills, wetlands, water treatment facilities, and agricultural sources. Penn State is partnering with the University of Colorado, the National Oceanic and Atmospheric Administration, and Picarro Inc. for this project. (DOE funding: $1,782,725; cost share: $452,741; duration: 36 months)

Converting Contaminated Water — Battelle (Columbus, Ohio) and its partners have developed a patented Flotation Liquid-Liquid Extraction (HydroFlex™) technology that can treat water affected by acid mine drainage for remediation and discharge. Because hydraulic fracturing also uses large volumes of water — which can strain local freshwater resources, particularly where such water supplies are scarce — the project will optimize the configuration of the HydroFlex technology to convert acid mine drainage–affected water into a valuable resource for the hydraulic fracturing industry. Implementation of the resulting technology will ultimately help to alleviate an environmental issue common in the mining regions of the United States. (DOE funding: $900,000; cost share: $225,000; duration: 24 months)