PROGRAM **facts**

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas & Oil

07/2005

DEEP TREK

The nation has only scratched the surface of the gas potential that exists in formations below 20,000 feet below the earth's surface. At present, development is limited to only the most promising deposits due to exponential increases in deep drilling costs and high risks. Deep gas wells are more than twice as expensive on a cost per foot basis as a typical gas well. According to the 2003 Joint Association Survey on Drilling Costs published by API, the cost to drill and equip the median gas well in 2003 was about $289,000 or $190/foot. The average, deep, non-deviated, on-shore well drilled in 2003 cost $6.82 million or $403/foot. It has also been established that in deep wells, 50% of the costs occur in the last 10% of the well. Overcoming barriers such as high temperature, high pressure, more caustic and harder geologic environments are the main reasons for the increased costs. The Deep Trek program is enabling the development of fundamentally new materials and components capable of surviving the high temperatures (>400 F) and pressures (>10,000 psi) present in deep well bores.

DOE technology will revolutionize the way industry drills for deep and ultra deep oil and gas by enabling new integrated drilling systems that will improve drilling efficiency by reducing costs (increased rate of penetration and improved tool durability), reducing risks (improving control in hitting the reserve target), improving reservoir access (extending the pressure and temperature range of drilling tools), reducing environmental impact (less time on site and reduced wastes) and increasing safety.

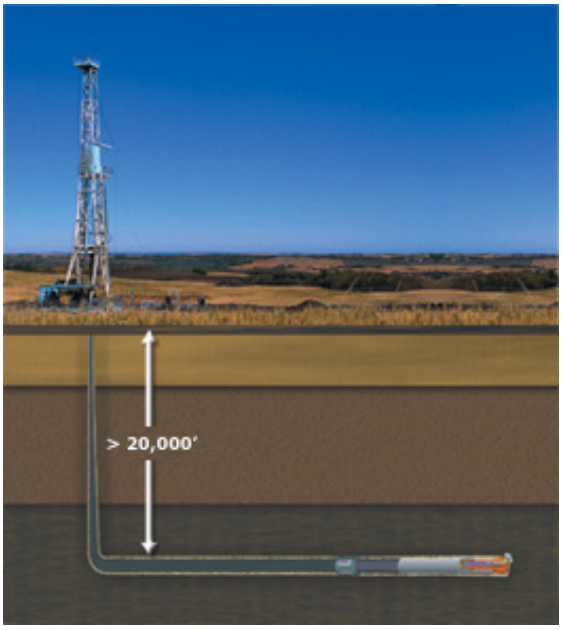
Status

2001 – Complete Roadmap

2002 – Select 5 projects

2003 – Select 3 projects

2005 – New Solicitation



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High Temperature Electronic Components — Honeywell International

This project is the cornerstone of the Deep Trek program. The goal of the project is to develop a suite of high temperature electronic components that can be used for instrumentation in deep gas drilling systems. Honeywell has formed a Joint Industry Participation (JIP) group which helped to develop system specifications and component priorities.

High Temperature/High Pressure MWD — Schlumberger Technology Corporation

The goal of this project is to design, develop and commercialize a high-temperature (400 degrees F), high-pressure, measurement-while-drilling tool that will be able to provide direction, inclination, toolface and gamma ray measurements continuously in real time. The tool will be fully retrievable while the drillstring is downhole, eliminating the need to remove the entire drillstring assembly to retrieve the MWD equipment.

Drilling Vibration Monitoring and Control System — APS Technology Inc.

The goal of this project is to develop a system to monitor and control drilling vibrations, which is one cause of premature equipment failure in deep wells. The two-component system includes a unique, multi-axis active vibration damper to minimize harmful axial, lateral and torsional vibrations. The hydraulic impedance (hardness) of this damper will be continuously adjusted using unique technology that is robust, fast acting and reliable. The second element is a real-time system to monitor 3-axis drill string vibration and related parameters including weight-on-bit, torque-on-bit and temperature. This monitor will determine the vibration environment and adjust the damper accordingly. In some configurations, it may also send diagnostic information to the surface via real-time telemetry.

Development of HT/HP Cement — Cementing Solutions, Inc.

The goal of this project is to develop a "supercement" capable of sealing the casing and formation annulus at high temperatures (exceeding 350 degrees F) and high pressures. The supercement will possess superior pipe and formation-bonding capabilities to ensure a tight annular seal at depths exceeding 15,000 feet. Repairing failed cement jobs in deep, hot wells costs the industry more than $100 million each year, often because the Portland cement systems used today cannot perform well at the conditions found in deep wells. This new formulation will have the tensile strength, permeability, compressive strength and expansive properties required for long-term durability, minimizing the potential for mechanical failures.

Optimization of Deep Drilling Performance Development and Benchmark Testing of Advanced Diamond Product Bits and HP/HT Fluids to Significantly Improve Rates of Penetration — TerraTek, Inc.

The goal of this project is to improve deep drilling performance through rigorous proof-of-concept testing of new drilling components at high borehole pressures. The project will develop and test prototypes of novel drill bits in high-temperature, high-pressure fluids suited for slow, deep-drilling operations. Researchers will benchmark the performance of these bits and fluids by conducting full-scale drilling tests in its laboratory followed by field testing and eventual commercialization of the systems that perform up to expectations

Electromagnetic Telemetry Tool for Deep Well Drilling Applications — E-Spectrum Technologies

The goal of the project is to develop a wireless, electro-magnetic (EM) telemetry communications system that will transmit data to and from downhole equipment in real time, enabling both surface processing of downhole sensor data and direct surface control of downhole tools. The project will build and field-test a prototype of the system for use at depths of at least 20,000 feet and temperatures up to 392° F (200° C). The system will be composed of a surface unit receiver/transmitter, downhole data-acquisition module, downhole repeater module, and a downhole receiver/transmitter module. The downhole components will be designed as stand-alone modules, using ruggedized mechanical packaging that will fit inside 1.25-inch O.D. pressure enclosures built within the drillstring.