



ENVIRONMENTALLY FRIENDLY DRILLING SYSTEMS PROGRAM **TECHNOLOGY INTEGRATION PROGRAM (TIP)**

Applying integrated technologies in unconventional gas production

The **Environmentally Friendly Drilling (EFD)** program, managed by the Houston Advanced Research Center (HARC), integrates advanced technologies into systems that significantly reduce the footprint of petroleum drilling and production in environmentally sensitive areas. The objective is to identify, develop and transfer critical, cost effective, new technologies that can provide policy makers and industry with the ability to develop reserves in a safe and environmentally friendly manner.

The program continues to add participants from environmental organizations, academia, state and federal agencies, government laboratories, and industry. Currently over 100 organizations support this effort including financial assistance. The partnership identifies new technologies and transfers them to areas that must incorporate new practices to address environmental concerns. Regional partners optimize technologies to fit the needs of their locale. Partners routinely come together to discuss progress with the sponsors/advisors. The program was honored with the Environmental Partnership Chairman's Stewardship Award from the Interstate Oil and Gas Compact Commission at their 2009 annual meeting.



Technology Integration Program (EFD-TIP)

The EFD Technology Integration Program (TIP) is an *integrated approach for applying new technologies in unconventional gas production*. The TIP coordinates technology development as opposed to single projects such that the whole has greater value than the sum of the parts. Objectives are

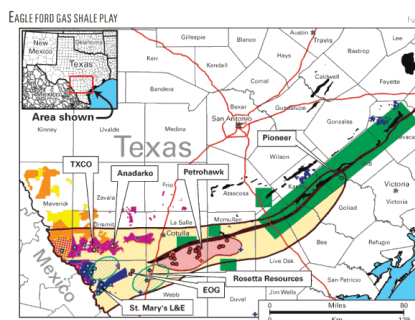
- (1) to integrate developing technologies into systems that lower cost and improve performance of unconventional gas shale development,
- (2) to bring new technologies to a "proving ground" where they can be evaluated for commercial potential,
- (3) to demonstrate technology to reduce the environmental footprint of operations and
- (4) to disseminate the information.

The TIP addresses both exploration and production of unconventional natural gas resources. The TIP addresses environmental impacts, including land, air, surface and ground water, emissions and societal. Technologies shall come from several sources: (a) service providers that are developing technologies (b) other RPSEA and NETL funded projects, and (c) the Environmentally Friendly Drilling Systems (EFD) Program. The TIP will work with other RPSEA programs and will build upon the successful EFD program's growing network of operators, service companies/suppliers, universities, national labs and environmental organizations that will allow us to identify new and successfully applied technologies, identify technologies that have been developed for other industries that have application, reach out to other funded programs to form teams that will facilitate integrated efforts, and integrate geologic concepts with engineering issues coupled to production and environmental issues.

The goals are:

- ◆ **Speed the commercial development** of technology developed through RPSEA programs.
- ◆ Create an **organizational structure** to facilitate field deployment of such RPSEA technology, coordinate such deployment, and document/transfer the effectiveness of the field operations.
- ◆ **Document and provide the results** of technology field trials so that promising processes, systems and products could be used in a wider range of unconventional natural gas plays.
- ◆ Perform field trials in **representative unconventional gas plays** so that results could be evaluated efficiently as to benefit both the industry, the organizations with the technology, and the public sector.
- ◆ **Emphasize programs that reduce cost and improve performance**, lessen the environmental impacts, or address the societal issues associated with unconventional natural gas development.
- ◆ **Report on safety improvements in the planning/demonstration of low impact projects**, emphasizing technologies being applied to foster a culture of safety and protecting the environment.

Key Deliverables: The TIP will deliver a reviewed set of technologies, chosen from funded projects and the current EFD project, selected by Advisory Committees. The key criteria for success will be based on (a) cost effectiveness, (b) ability to lower the environmental footprint, and (c) ability to address societal requirements for the community. A “Proving Ground” will be created. The integrated technologies are expected to significantly accelerate the development of unconventional gas, including the Eagle Ford play. Industry will be engaged in dialog with policy makers to assist in creating local, state, and federal rules that protect the public and ecosystems while allowing development of the resources. The accelerated commercialization of technologies results in improved financial returns, lessened impact on local communities and ecosystems, and increased gas reserves. Technology Transfer/Outreach/Education materials include web sites, reports from conferences, brochures, and publications.



Benefits/Outcomes: The TIP *accelerates unconventional gas development* by integrating technology and systems to improve efficiency and lower the environmental impact. Technology developed under RPSEA and other federal funding will receive a *boost to commerciality and acceptance*. Accelerated commercialization results in financial returns for respective companies and validates research investments. The “*proving ground*” provides *best practices* for other areas. South Texas, home of the proving ground, *would benefit from better development of a sustainable resource*, one that provides jobs, a stable/secure energy source, and improved environmental outcome.

Participants: Houston Advanced Research Center, Texas A&M University, Texas A&M University – Kingsville, Texas AgriLife Extension Service, Sam Houston State University, Utah State University, Tom Williams, Epic Software, Petris Technology, Oak Ridge National Laboratory, University of Arkansas, University of Colorado, Land Steward Consultants, Black Brush Oil and Gas, Scott Environmental Services, Newpark Mats and Services, Natures Composites, MI SWACO, University of Texas Bureau of Economic Geology, AVI LLC (Rice University), Ames Energy Advisors, Fountain Quail, 212 Resources, Dow Chemical Company, Water Resources Company, Consumer Energy Alliance, Goodrich Petroleum Company, The Nature Conservancy, Campbell Applied Physics, Rancho San Pedro, Petrohawk.

Environmentally Friendly Drilling Program

For 20 years, we have worked to reduce our environmental footprint. Remarkable progress has been made.

The program has shown we can **reduce the footprint more than 90%** with a further reduction in the impact on the environment if low impact technologies are combined in a system.

From the past...
(multiple well sites)



...to the present drill site pad
6 times smaller and able
to access multiple wells
from **ONE** location



System includes:

- Modular small footprint rigs with reduced emissions.
- Pad drilling of multiple wells from one site.
- New downhole logging and steering tools.
- Closed loop drilling fluid systems.

Managed by the Houston Advanced Research Center (HARC), Texas A & M University, Sam Houston State University and TerraPlatforms LLC
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The project has been co-funded by the DOE National Energy Technology Laboratory, Research Partnership to Secure Energy for America (RPSEA), industry and environmental organizations.

SPONSORS



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