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June 3, 2011

Mr. John Deutch
Chairman, Hydraulic Fracturing Study Group
Secretary of Energy Advisory Board

Dear Mr. Deutch,

I would like to follow-up on the public comments that Mr. Jim Slutz made at the study group meeting on Thursday, June 2, 2011. Mr. Slutz mentioned the Environmentally Friendly Drilling Systems (EFD) Program and the research that we are performing to address the balance between environmental tradeoffs and energy production.

Our EFD research program is currently operating at approximately two million dollars per year, funded by federal and state government agencies, industry and environmental organizations. Our world-wide effort is focused on reducing the environmental footprint associated with oil and gas operations. In addition, we have a substantial outreach effort that engages all stakeholders.

As Mr. Slutz explained, various segments of our program may be of interest to the study group, including:

- Development of a scorecard to measure the performance of operations with respect to environmental and societal tradeoffs.
- Management of a best management practices web site (www.oilandgasbmeps.org) that links best practices to rules and regulations on a regional basis.
- Determining the effectiveness of processing flowback/produced water – performing field measurements and comparing how effective different systems are in handling the flowback from hydraulic fracturing treatments.

Information on our program may be found in the attached and at our web site: www.efdsystems.org. In addition, please let me know if you would like us to participate in any study group meetings that you may have in the future.

Regards,

A handwritten signature in black ink, appearing to read 'Richard C. Haut', is written over a light blue horizontal line.

Richard C. Haut, Ph.D.
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ENVIRONMENTALLY FRIENDLY DRILLING SYSTEMS PROGRAM

Cost Effective Technologies for Environmental Protection

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, funded by federal and state government agencies, industry and environmental organizations, was honored with the Environmental Partnership Chairman's Stewardship Award from the Interstate Oil and Gas Compact Commission at their 2009 annual meeting.



Technology Transfer activities, engaging and informing industry, regulators and the public, include the human dimension of technology incorporation in societal areas. The outcome of the program is expected to result in reasonable regulatory controls, lower development cost and reduction of the environmental footprint associated with operations. The EFD Program has created a world-wide University/National Laboratories Alliance to fund and transfer critical new technologies that accelerates development of domestic reserves in a safe and environmentally friendly manner. This world-wide research team has made great strides in best management practices related to drilling rig technologies, logistical support, produced water, air emissions, protecting wildlife and endangered species and other issues related to oil and gas operations. In addition, the team has developed techniques and processes to measure the balance between environmental/societal issues and energy production. Projects have been successfully carried out throughout the USA (from Alaska to Texas, from the Marcellus to the western slope of the Rockies) and throughout Europe (The Netherlands, Ukraine).

<p>SPONSORS</p>	<p>MANAGEMENT TEAM</p>	<p>ENVIRONMENTAL ORGANIZATIONS</p>
	<p>ALLIANCE MEMBERS</p>	<p>COLLABORATORS</p>

The EFD Scorecard

An environmental scorecard has been developed to measure the tradeoffs associated with implementing low impact drilling technology in environmentally sensitive areas. The scorecard assesses drilling operations and technologies with respect to air, site, water, waste management, biodiversity and societal issues. Low impact operations reduce the environmental footprint through the adoption of new methods in (1) getting materials to and from the rig site (site access), (2) reducing the rig site area, (3) using alternative drilling rig power management systems, and (4) adopting waste management at the rig site. The scorecard enables a dialog to be established and maintained among all interested, concerned and affected stakeholders. In this manner, the industry has a way of seeing itself within the larger network. The scorecard presents an ecological understanding of the tradeoffs associated with producing energy. The methodology was developed through a series of workshops being held with ecologists, botanists, wildlife management experts and others in addition to oil and gas industry experts.

EFD Facts		
Project:		
Location:		
Ecosystem:		
	Max	Score
AIR	10	0
WATER	20	0
SITE	20	0
WASTE MANAGEMENT	20	0
BIODIVERSITY/HABITAT	15	0
SOCIETAL	15	0
	100	0

The overall objective of the scorecard is to have a means of measuring the environmental and societal tradeoffs associated with an energy development project. Industry has done an effective job of making safety a core value within each and every employee. The scorecard can assist in the development of a mindset that environmental stewardship is a core value. In addition, the scorecard enables all stakeholders to understand the balance between energy development and the impact on the environment.

Why Use the Scorecard?

Development of energy resources is important to the economic development and security of our nation. The scorecard enables a methodology to be employed that documents the environmental and societal tradeoffs associated with energy development. The scorecard enables operating companies to make use of the principle of **what gets measured, gets done**.

Environmentally Friendly Drilling (EFD) practices can substantially reduce negative environmental impacts and promote balance between nature and energy development. In addition, EFD practices may be cost effective, enhance public relations, increase worker productivity and reduce potential liabilities.

Having an operation certified through the use of the Scorecard can demonstrate how an operating company successfully manages operations. In addition, using EFD practices may reduce overall costs, enhance public image, increase productivity and reduce potential liability issues. EFD practices have environmental, economic, and social elements that benefit all stakeholders, including operating companies, service companies, suppliers, contractors, regulators, landowners and the general public.

What Gets Identified, Gets Dealt With

The objective of the EFD scorecard is to have a methodology that is meaningful, simple and easy to implement and understand. Six attributes were identified as meaningful to evaluate: site (soil/sediment), water, air, waste management, biodiversity/habitat and societal issues. The scorecard provides a means to make environmental and societal issues core business values. Each attribute has several layers or sub-attributes. As an example, within biodiversity, the potential threat to wildlife due to proximity or timing of operations could be assessed and minimized. Drilling activities have the potential risk of temporarily interfering with wildlife. The risk can be mitigated through proper planning and monitoring of operations.

Academia	Environmental Organizations	Industry	State/Federal Agencies
<ul style="list-style-type: none"> • Texas A&M University College Station • Texas A&M University Kingsville • Mississippi State University • Sam Houston State • University of South Alabama • John Hopkins University • University of Arizona • University of Texas • University of Houston 	<ul style="list-style-type: none"> • NRDC • The Nature Conservancy • Conservation International • Bureau of Applied Anthropology/Arizona • Clinton Climate Initiative • Rocky Mountain Clean Air • McFaddin Ranch 	<ul style="list-style-type: none"> • API • Ballard Exploration • BP • Shell • Chevron • StatoilHydro • ConocoPhillips • Devon • King Exploration • Halliburton • Huisman • National Oil Well – Varco • MI Swaco • TerraPlatform • T. Baker Smith • Weatherford • Derrick Equipment • Composite Mats • PTTC • IADC 	<ul style="list-style-type: none"> • US Department of Energy • Bureau of Land Management • US Park Service • Texas Railroad Commission • Texas General Land Office • Texas Dept. of Agriculture • Texas Dept. of Transportation • US Minerals Management Services • Texas Parks & Wildlife • Texas Water Board • Texas Commission on Env. Quality • US Fish and Wildlife • Argonne National Laboratory • Big Thicket Preserve • Idaho National Laboratory

Participants in the development of the scorecard.

Intermountain Oil and Gas BMP Project: www.oilandgasbmps.org

The Natural Resources Law Center (NRLC) at University of Colorado Law is currently developing a free-access, searchable, database and supporting website for best management practices (BMPs). The NRLC has developed a beta version of the database/website in conjunction with project partners and advisors from government, industry, the conservation community, and academia. This test version, launched in March 2009, focuses on the Intermountain West (CO, MT, NM, UT, WY). It includes federal, state, and local regulatory requirements as well as voluntary practices currently in use, required, and/or recommended for protection of surface resources.

The BMP database is not intended to represent a consensus on what the best practices are for specific applications nor to advise users on the current legal requirements for specific locations. Rather, the database describes each practice and documents the source of the practice (who requires or recommends it in what specific applications). The database provides a link to the source of the BMP and, where possible, it provides supplemental information, including construction specifications, illustrations, pictures, maps, monitoring reports, and evaluations of the potential of the practice for mitigating impacts of development.

The database and website were designed/constructed with the advice/assistance of many partners and advisors. Participation by the following groups is gratefully recognized, but does not imply their endorsement of any particular practices. In addition, the Center takes full responsibility for any errors in the database and website. Entities in **bold text** have provided funding for the project and are gratefully acknowledged.

BEST MANAGEMENT PRACTICES

The Natural Resources Law Center and its partners welcome you to this free-access website of best management practices (BMPs) for oil and gas development in the Intermountain West. The focus of this website is a searchable database addressing surface resources affected by oil and gas development. The database includes both mandatory and voluntary practices currently in use and/or recommended for responsible resource management in the states of Colorado, Montana, New Mexico, Utah, and Wyoming.

The BMP database is not intended to represent a consensus on what the best practices are for specific applications nor to advise users on the current legal requirements for specific locations. Rather, the database describes each practice and documents the source of the practice (who requires or recommends it in what specific applications). The database provides a link to the source of the BMP and, where possible, it provides supplemental information, including construction specifications, illustrations, pictures, maps, monitoring reports, and evaluations of the potential of the practice for mitigating impacts of development. Because practices change over time, database users should check with appropriate authorities to verify the latest requirements and recommendations for your area.

BMP CATEGORIES

The database includes BMPs to address a variety of resources and issues...

- Air quality
- Aquatic/riparian values
- Climate
- Cultural/historic
- Grazing
- Health/safety
- Noise
- Other
- Socioeconomic
- Soils/surface
- Vegetation
- Visual aesthetics
- Water quality
- Wildlife
- Wildlife, disruption
- Wildlife habitat

WHAT'S NEW

Our newest Law & Policy page addition is the [State Court Law](#) page. Oil and gas development sites may either use, produce, or affect the quality of a great deal of water, depending on the production methods used. Federal and state law govern the use and discharge of this water and, consequently, both federal and state court cases help interpret the laws and how they are applied.

The BMP Project was a sponsor of the [Opportunities and Obstacles to Reducing the Environmental Footprint of Natural Gas Development in the Uintah Basin](#) Workshop held in Vernal, Utah, on October 14, 2010. See the above webpage for the agenda and powerpoint presentations made at the workshop.

Our newest Database effort is to incorporate cost/benefit analysis data and information on the effectiveness of specific BMPs.

BMP SEARCH

What management practices are recommended or required for oil and gas development? To find out, use the drop-down menus or type keywords. For a more refined search, click "Advanced Search" or use the **BMP SEARCH** button.

Keywords: _____

Category: _____

Location: _____

[Advanced Search...](#)

TRAINING AND WORKSHOPS

The BMP Project was a sponsor of the [Opportunities and Obstacles to Reducing the Environmental Footprint of Natural Gas Development in the Uintah Basin](#) Workshop held in Vernal, Utah, on October 14, 2010. See the above webpage for the agenda and powerpoint presentations made at the workshop.

The BMP project hosted its first workshop on October 14, 2009 in Rifle CO: [Best Practices for Community and Environmental Protection](#). Almost 60 people participated in a field trip hosted by Williams Production and over 170 attended the sessions at the Garfield County Fairground. See the above webpage for the agenda and powerpoint presentations made at the workshop.

We welcome requests for training in the use of the BMP Database. To arrange a training or for help with a custom search, [contact us!](#)

SEARCH THE BIBLIOGRAPHY

Our searchable bibliography includes over 400 publications, including environmental impact statements, agency guidelines, and many technical reports, websites, and journal articles prepared by government agencies, academics, environmental advocacy groups, and industry. These publications are:

- Source Documents from which we have derived BMPs for the database, and
- Supplemental Documents that provide more detailed descriptions of specific BMPs or background information on oil and gas development and its impacts (listed on our [RESOURCES](#) pages.)

PARTNERS

The structure and content of this website is being developed in conjunction with project partners

- Banko Petroleum Management, Inc.
- BP
- Bureau of Land Management
- Center for Native Ecosystems
- Club 20
- Colorado Department of Natural Resources
- Colorado Department of Public Health and Environment
- Colorado Division of Wildlife
- Colorado Mountain Club
- Colorado Natural Heritage Program
- Colorado Oil and Gas Conservation Commission
- Colorado School of Mines, Department of Petroleum Engineering
- EnerCrest
- Environmentally Friendly Drilling Systems Program**
- Liz Claiborne Art Ortenberg Foundation**
- Miller, Agro & Robbins, LLC**
- Montana Fish, Wildlife and Parks
- Montana Wildlife Federation
- National Wildlife Federation
- Natural Resources Defense Council
- New Mexico Game and Fish

- New Mexico Oil Conservation Division
- Research Partnership to Secure Energy For America**
- Rocky Mountain Clean Air Action
- Rocky Mountain Mineral Law Foundation**
- Petroleum Field Services, LLC**
- Theodore Roosevelt Conservation Partnership
- The Nature Conservancy
- The Wilderness Society
- University of Colorado Law School**
- University of Colorado, Outreach Office**
- Upper Green River Valley Coalition**
- U.S. Forest Service, Rocky Mountain Region
- Utah Public Lands Policy Coordination Office
- Western Colorado Congress
- Western Resource Advocates
- WildEarth Guardians
- William D. Ruckelshaus Institute of Environment and Natural Resources**
- Williams Production RMT Company
- Wyoming Game and Fish Department
- Wyoming Reclamation and Restoration Center

The Environmentally Friendly Drilling (EFD) program integrates several projects and programs that are funded by the Research Partnership to Secure Energy for America (RPSEA), the U.S. Department of Energy through the National Energy Technology Laboratory (NETL), private industry and environmental organizations. Additional funding is from the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) through the Coastal Impact Assistance Program (CIAP) managed by the Texas General Land Office. Other example programs and projects include:

- ◆ **Systems Engineering Design Methodology: Low Impact Well Design Optimization:** Developing a computer program to enable operators to select and optimize environmentally friendly systems for drilling operations.
- ◆ **Produced Water Studies:** Investigating the various issues associated with processing produced water in the Marcellus Shale.
- ◆ **Dissemination and Decision Support:** Replicating the effort performed under the Low Impact Natural Gas Operations program for the Haynesville Shale. Developing a GIS based information site that includes operational information, permits, endangered species, topography and other information.
- ◆ **Western Mountain States Studies:** developing a prototype lay down road system and initial field testing.
- ◆ **Societal Acceptance:** Investigating public perception of unconventional natural gas operations in Eastern Utah.
- ◆ **Eastern Mountain States Studies:** Identifying barriers associated with unconventional natural gas development in the Marcellus Shale.
- ◆ **Prototype Small Footprint Drilling Rig:** Testing prototype new technologies that have lower-cost and lower environmental impact that can benefit domestic exploration and production.
- ◆ **Air Emissions Studies:** Developing guidelines for reducing emissions from large diesel engines associated with natural gas operations.
- ◆ **Reduced Hydraulic Fracturing Footprint:** Identifying alternatives to reduce the footprint including offsite operations and innovative fracturing technologies such as a novel process involving: minimal pumping equipment, low volumes of frac fluid and materials that are environmentally green and non-damaging.
- ◆ **Ecosystem and Biodiversity—Measurement and Assessment:** Developing tools for adaptive ecosystem management to assist integrated management of land, water and living resources that promotes conservation and sustainable use.
- ◆ **Coastal Impacts Technologies Program:** Performing research, demonstration and application of technologies to reduce the environmental footprint of operations in the 18 Texas coastal counties.
- ◆ **Ukraine Gas Shale Development Strategy:** Reviewing and recommending rules/regulations for developing the gas shales in the Ukraine. Working with government agencies to establish stakeholder engagement and outreach activities.

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