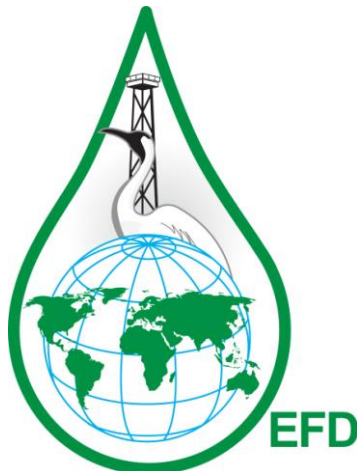


The Technology Integration Program

An Extension of the Environmentally Friendly Drilling Systems Program

TECHNICAL CONTACT: Richard C. Haut/rhaut@harc.edu/281-364-6093

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



Public Executive Summary

Title: The EFD Technology Integration Program

Offeror: Houston Advanced Research Center (HARC), The Woodlands, Texas

P.I.: Dr. Rich Haut, Research Scientist, rhaut@harc.edu, 281 364 6093

Topic: Project Integration

Program Vision: The proposed program is aimed at the *topic 4 Project Integration* as defined in the request for proposals. 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: 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.

Description: 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:

1. ***Speed the commercial development*** of technology developed through RPSEA programs.
2. Create an ***organizational structure*** to facilitate field deployment of such RPSEA technology, coordinate such deployment, and document/transfer the effectiveness of the field operations.
3. ***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.
4. 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.
5. ***Emphasize programs that reduce cost and improve performance***, lessen the environmental impacts, or address the societal issues associated with unconventional natural gas development.
6. ***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.

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

B. TECHNICAL APPROACH

B.1 Detailed Work Plan (Statement of Work)

EFD Technology Integration Program (TIP)

I. OBJECTIVES:

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 O&G operations and (4) to disseminate the information.

II. SCOPE OF WORK

The overall mission is to identify and facilitate the integration of various projects/programs that can impact the unconventional natural gas developments in an environmentally sensitive and cost effective manner. The project will address both exploration and production. Environmental impacts include: land, air, surface and ground water, emissions and societal. Technologies shall come from a variety of sources: (a) service providers that are developing new technologies (b) other RPSEA and NETL funded projects, and (c) tasks relate to 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:

- 1) ***Speed the commercial development*** of technology developed through RPSEA programs.
- 2) Create an ***organizational structure*** to facilitate field deployment of such RPSEA technology, coordinate such deployment, and document the effectiveness of the field operations.
- 3) 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.
- 4) ***Emphasize programs that reduce cost and improve performance***, lessen the environmental impacts, or address the societal issues associated with unconventional natural gas development.
- 5) ***Document and provide the results*** of technology field trials so that promising processes, systems and products could be utilized in a wider range of unconventional natural gas plays.
- 6) ***Include/report on safety improvements in the planning/demonstration of low environmental impact projects***, emphasizing technologies that foster a culture of safety/environmental protection.

III. TASKS TO BE PERFORMED

PHASE I

Task 1.0 Project Management Plan (PMP)

HARC shall develop a PMP consisting of a work breakdown structure and supporting narrative that concisely addresses the overall project as set forth in the agreement. HARC shall provide a concise summary of the objectives and approach for each Task and, where appropriate, for each subtask. HARC shall provide schedules and planned expenditures for each Task including necessary charts and tables, and all major milestones and decision points. HARC shall identify key milestones that need to be met prior to project proceeding to the next phase. This report is to be submitted within 30 days of the Award. The RPSEA Project Manager shall have 20 calendar days from receipt of the PMP to review and provide comments to HARC. Within 15 calendar days after receipt of the RPSEA's comments, HARC shall submit a final PMP to the RPSEA Project Manager for review and approval.

Task 2.0 Technology Status Assessment (TSA)

HARC shall perform a TSA and submit a summary report describing the state-of-the-art of the proposed technology. The report shall include both positive and negative aspects of each existing technology. The report shall be approximately three to eight typewritten pages in length. The report will not contain any proprietary or confidential data, as the report will be posted on the RPSEA website for public viewing. The report will be submitted within 30 days of the Award.

Task 3.0 Technology Transfer Plan (TTP)

HARC shall work with RPSEA throughout the project to develop and implement an effective overall TTP. Technology transfer activities will consist of both project and program level activities amounting to not less than 2.5% of the total cost of the project. The total cost of the project is the value of funds provided by RPSEA plus the value of HARC's cost share. HARC shall nominate work/activities for 1.5% of the total cost for project level technology transfer activities. This work/activities may typically include writing technical papers and, as appropriate, participation in agreed to conferences and workshops. RPSEA will reserve 1% of the total cost for program level technology transfer activities. The project level TTP will be submitted to RPSEA within 30 calendar days of Project kick-off. Technology transfer activities will also be detailed in the PMP. HARC will report the cost associated with project level technology transfer activities on each monthly report. DOE periodically will request information from HARC through RPSEA for the purposes of estimating or evaluating the benefits of the program and for review of Project Summary Sheets, newsletter articles and project status and successes. HARC shall provide information requested by RPSEA to support DOE's quantitative estimation of program benefits.

The TIP will further the network of publications, articles, workshops, conferences that has been established in the well-used website already in place in the EFD program.¹

Task 4.0 Integration of RPSEA Projects

In 2008 the EFD program created a Technology Alliance between top tier Universities, U.S. DOE National Laboratories and RPSEA.² The purpose was to develop critical new technology, to accelerate development of domestic reserves in a safe and environmentally friendly manner. In the past three years regional workshops were held in the East (Pittsburgh), the Rockies (Vernal, Utah and Rifle, CO), Texas, and Arkansas. The new EFD TIP will continue and augment that effort with new participants, and a new emphasis on technology integration to speed commercialization of funded RPSEA Projects.

Meetings/workshops will be held with teams working on RPSEA projects to select promising technologies. These initial workshops will be followed by various follow-up meetings to identify key priorities and focus the effort. The current EFD advisory committee, consisting of industry, government, academia and environmental organizations, will be invited to participate in the workshops. The outcome of this set of meetings will be the development of field test plans, education/outreach materials and plans on how to integrate the various projects on web sites and other technology transfer materials.

Subtask 4.1 Initial Meetings and Workshops

The TIP will work with EFD Alliance members and other RPSEA research teams to organize meetings to identify synergies among projects that are funded, to identify Advisory Committees, to plan field tests and to gather information for technology transfer, education and outreach. These workshops will be organized by basins (New Albany, Piceance, Marcellus, others) or by project areas (Integrated Basin Analyses, Well Site/Drilling, Completion/Hydraulic Fracturing, Produced Water, Production Operations). Deliverables will be reports that include plans for follow-up meetings, how information will be gathered for technology transfer/education/outreach activities and field trials.

Subtask 4.2 Follow-up Meetings

The EFD TIP Alliance members will organize follow-up meetings based on the outcome of the initial meetings. Each will be documented with a report. These meetings will provide reviews of various field trial plans, progress and results as well as reviews of the technology transfer/education/outreach activities.

Task 5.0 Education/Outreach – Virtual Unconventional Natural Gas Development

At present, information on unconventional gas development is scattered among thousands of data bases, company and association web sites, environmental organizations, and private data bases. Web

¹ www.efdsystems.org

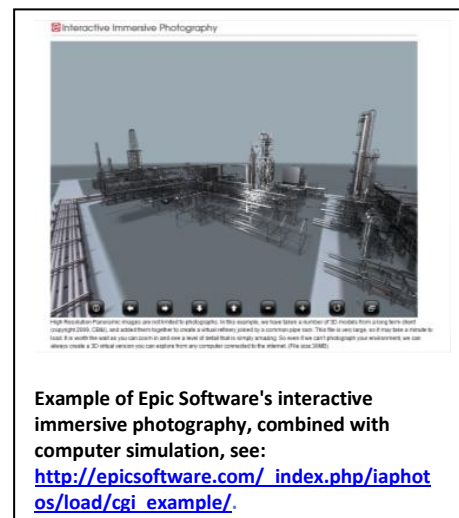
² <http://sites.google.com/a/pe.tamu.edu/efd-alliance/Home>

search engines return thousands of web links in response to queries. For example, the web site Wikipedia *Gas Shale* was accessed over **30,000 times** during the month of October, 2010.³ The problem then, is how to gain access to valid and accurate data related to new knowledge, new drilling technology and best operating experiences in shale development. As with most issues, applying the relevant context is essential to understanding the relevant substance. The EFD TIP program plans to create teams to help collate information relating to RPSEA funded research. The majority of the RPSEA projects that have been awarded may be mapped into four different areas:

Project/Tech	New Albany	Piceance	Marcellus	Generic Field
Integrated Basin Analysis	07122-16	07122-09 07122-14 07122-15 08122-40	09122-04 09122-32 08122-55	07122-22 08122-15 07122-29 07122-35 08122-45 08122-53 09122-11 09122-29
Well Site/Drilling				08122-35 09122-41
Completion/Hydraulic Fracturing			09122-06	07122-07 07122-33 07122-38 07122-41 08122-48 09122-02 09122-30
Produced Water		07122-12	08122-05	08122-36
Production Operations			07122-27	07122-23 07122-36 07122-44 09122-01

(Numbers listed in the table refer to the RPSEA award number taken from the RPSEA web site.)

A web site will be developed that integrates the RPSEA work being done at each of these four shale plays. From the home page of this web site, a visitor can quickly drill down to find out specific information about each play. Conversely, a visitor interested in a specific technology (for example, finding information concerning Integrated Basin Analysis) could instantly access the work being done in that technology across all four plays. In addition, a powerful search application will supplement this matrix technology to enable a site visitor to locate information in a variety of ways. Deliverables will be a site that employs state-of-the-art computer graphics, simulation and video, where appropriate, as described in the subtasks.



Subtask 5.1 Gas Shale Virtual Sites

The TIP team will work with RPSEA teams to identify information that can be used to develop web sites, education, work force development/outreach materials that integrate the objectives and results from the projects. As a minimum, a micro-site for four unconventional natural gas plays: Piceance, Marcellus, New Albany and Eagle Ford and one generic play will be developed. Additional plays, for example, Barnett, Woodford, Haynesville, Fayetteville, will be considered. Petris will develop a GIS based analytical tool that will aggregate attributes and considerations that are spatially distributed in the region of interest. Topics for layers include, lease boundaries, roads, wildlife migration patterns, waterways,

³ http://stats.grok.se/en/201010/Shale_gas

aquifer recharge areas, archeological assets, etc. Map layers can also include proximity values, such as distance from noise sources or distance from schools or hospitals.

The baseline content will be developed through cooperative efforts with HARC, the University of Arkansas, Texas A&M Kingsville, University of Colorado, Oak Ridge National Laboratory and other contributors. Software tools are to be developed to assist operators and landowners select appropriate well sites and placement of pipelines and lease roads. This effort coupled with options for road construction and pad materials will be one of the deliverables in this task. Select federal, state and local laws and regulations specific to the four main gas plays will be compiled, compared, and displayed on the websites. These comparisons can help stakeholders identify provisions that unnecessarily impede development as well as those that are important for community and environmental protection.

Oak Ridge National Laboratory (ORNL) will use the Sensorpedia network⁴ for the integration and analysis of data streams from multiple, diverse sources. The network will be developed with input from Texas A&M University Kingsville Environmental Engineering Department and Institute for Sustainable Energy and the Environment.

Subtask 5.2 Generic Unconventional Natural Gas Development Site

The TIP team believes that much of the information gathered from the RPSEA projects will be applicable to more than one unconventional gas play. The objectives and results from the projects will be used to develop a generic natural gas development site that explains the technologies and their tradeoffs. This will include, for example, hydraulic fracturing, horizontal drilling, gas compression, etc. Through compilation of regulatory information from the existing shale play regions and consultation with project partners and advisors, Colorado staff will create a catalogue of elements that might be included in a model state/local government regulatory framework.

Subtask 5.3 Presentations, Exhibits, Technology Outreach

Technology transfer, outreach and education are key parts of the TIP. The TIP will work with RPSEA to develop suitable materials, to participate in appropriate exhibits, trade shows and conferences, and to develop and present papers, talks and articles. A report will document exhibit, trade show and conference involvement. Papers and articles presented and published will also be shared through the TIP web site. One unique advantage the TIP has is the relationship with the county extension service representatives from Texas A&M's Agri-Life College.⁵ This overlaps with Subtask 6.5 Field Tests – Wildlife/Bio-Environment Mitigation Strategies. Similarly, the University of Colorado best management practices web

⁴ <http://www.Sensorpedia.com>

⁵ <http://agrilifeextension.tamu.edu/programs/agnr/>

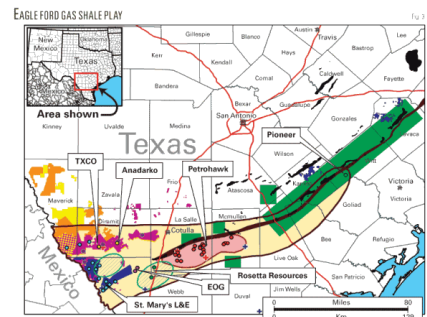
site,⁶ part of the EFD program, will participate in this effort. Colorado staff will assist with preparing materials for the Piceance Basin website and the generic website, as well as help to maintain consistency among the sites. Colorado staff will also assist with dissemination of materials through their existing BMP project website. Maintaining a TIP team with partners in each of the regions will be helpful in outreach to the non-industry stakeholders in the specific communities as well as other states in the region.

Subtask 5.4 Integrated Environmental Impact Assessments/Work Force Development

The development of the Eagle Ford Shale will create thousands of jobs in the region (for comparison, it has been estimated that the jobs created in the past five years in the Barnett shale has been equivalent to one Boeing aircraft plant opening every six months). This signifies a significant work force opportunity – and need – in South Texas, a region of the country considered “economically distressed.” To assist the TIP team in its technology transfer/outreach/education objectives, an interdisciplinary team of faculty and graduate students at TAMUK will use the education/outreach materials described above (i.e., website, GIS and visualization software, interactive immersive photography, Sensorpedia network) to perform an integrated environmental impact assessment (EIA) of the Eagle Ford Shale development. The EIA will incorporate the results of the TIP field trials complemented by student-led on-site monitoring. Deliverables will be environmental impact assessments and reports of operations.

Task 6.0 Field Testing and Characterization – Eagle Ford Shale

The Eagle Ford is a major unconventional gas development like the Haynesville, Marcellus, Barnett and others. The Eagle Ford lies in south Texas in the Cretaceous Eagle Ford shale, which is long known for sourcing hydrocarbons to Austin Chalk fields as well as the renowned East Texas field. The play extends from near the Mexican border outward to the east/northeast across several counties. The Eagle Ford Shale play in South Texas was chosen because it represents a typical shale play undergoing rapid development. Petrohawk Operating Company announced their well discovery in late 2008 and in 2009, Texas A&M focused its attention to developing the play in an environmentally “friendly” manner. Students in a graduate drilling class of Texas A&M University's Department of Petroleum Engineering were asked to work on a semester-long team project --to develop well designs for a low impact field development program in the Eagle Ford Shale. Results from those graduate team exercises plus information from meeting with landowners and industry representatives made it clear that the burgeoning drilling future could not be sustained – protection of ground water resources is critical and low impact surface operations must be used.



⁶ www.oilandgasbmpps.org

The Eagle Ford is being developed with horizontal wells incorporating multi-stage frac operations. Recent well completions are using more than 10 million gallons of fresh water with 90% of it being withdrawn from fresh water aquifers (Carrizo and Queen City). Recycling and re-use of frac flow back brine and produced water is a cornerstone of the EFD TIP program in this project.

Subtask 6.1 Eagle Ford Characterization

The University of Texas Bureau Of Economic Geology will produce a comprehensive Technology Assessment report on the Eagle Ford Shale Play. This report will cover the entire areal extent of this area and include both surface and subsurface geological analysis. Surface features include topography, fresh water, brackish ground water and other features that would impact natural gas development. Ground water zones will be identified with an analysis on the capacity of these zones to provide adequate water for drilling fluid and fracturing water make up. Analysis on the subsurface area will show zones that are best candidates for disposal. This report will be conducted in the first 90 days after award.

Subtask 6.2 Field Tests – Locating Sites

Environmental Land Steward Consultants will supervise incorporation of new technology to minimize disturbance. Programs supported by the EFD Program during the years 2004-2010 will be adapted to South Texas to assist in site selection, lease roads, rigs, lines, frac ponds, compressor stations, and power lines. The goal is to allow new technology to influence positively land use, to reduce environmental impacts while retaining cost effective well plans and surface operations. The deliverable from this segment will be a documented process handbook describing “best practices” for site operations. This effort, combined with emissions monitoring (Subtask 6.7) will represent an environmentally friendly drilling system with an environmental footprint estimated to be 90% less than normal drilling operations.

Subtask 6.3 Field Tests – Water Management

The TIP provides a proving ground for the new water treatment and re-use technologies. A number of these water treatment business ventures are joining Texas A&M’s team (*GPRI Designs™ Desalination Technology*) to prove out the technology and to provide documented data for pilot plant, field trials, and potentially full scale commercial operations. This task is supported by MI SWACO, Dow Chemical, 212 Resources, and Water Resources Company.

The specific tasks in the Eagle Ford will be to perform tests on frac water flow back and produced brine to identify the required level of treatment that is best for re use in subsequent fracturing operations. The proving ground concept allows this group to share information collected by the TIP team (basic water chemistry, water needs, logistics) and to have access to field sites in South Texas provided by landowners and operators. Sponsors and supporters are providing sites on their ranches and at their sites. Deliverables

will be provided at various times during the project. Field tours to sites to review operations will be coordinated by Texas A&M, who will be providing the mobile lab to support the trials.

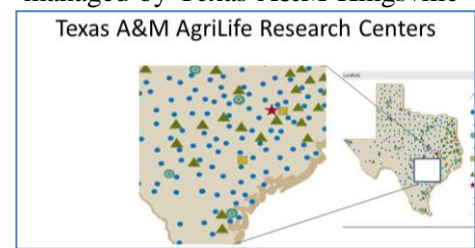


Subtask 6.4 Field Tests – Drilling and Completion Operations

The EFD project has conducted studies on the advances of small footprint rigs and power sources that are more efficient, require less fuel, produce fewer emissions, and are quieter. Rig advances have closed loop systems that eliminate mud pits, and have a lower profile. Automatic drilling systems, MWD and LWD advances coupled with downhole tools such as rotary drilling systems and motors have allowed these rigs to accurately drill a large geological with multiple wells from a single pad. These advances have been incremental incorporated from many rig manufacture and contractor companies. These rigs have a higher day rate but are more efficient and can get in and out faster with less environmental impact. They are also safer. Advances in rig design and efficiency continue to be made and many of these advanced will be demonstrated, but the challenge is the fact that there are many older generation rigs are still be used because of their low day rates and uninformed operators who need to retire these inefficient rigs of the past. Regulators, land owners and managers also need to be informed on these advantages and options. With smaller rigs there can be tradeoffs. This report will document what these tradeoffs are and what are the appropriate requirements operators and should know. This task will demonstrate what is possible, the cost effectiveness and environmental benefits of using a modern rig. This report will acknowledge these will vary by region and geology.

Subtask 6.5 Field Tests – Wildlife/Bio-Environment Mitigation Strategies

This subtask is coupled with a parallel effort headed by Texas A&M University Kingsville (Subtask 5.4 Integrated Environmental Impact Assessment/Work Force Development). Work will be coordinated through the Institute for Sustainable Energy and the Environment ⁷ managed by Texas A&M Kingsville Texas. The NSF sponsored Center fosters fundamental research and development for promoting the concepts of sustainability of ecological and environmental systems in the semi-arid coastal areas of South Texas.



⁷ <http://www.stei.org/index.shtml>

An additional resource available to TIP is the county extension service representatives from Texas A&M’s Agri-Life College.⁸ The Texas AgriLife Extension Service provides outreach in the areas of agriculture, environmental stewardship, youth and adult life skills, human capital and leadership, and community economic development. The Table below shows the extent of these agents, available to assist the community relate to new economic development caused by the Shale play.

Research Center Corpus Christi	soil fertility/chemistry research, environmental stewardship, biofuel production, and water quality	http://ccag.tamu.edu/
La Salle County Extension Cntr		http://la-salle-tx.tamu.edu/
Karnes County Extension Office		http://karnes-tx.tamu.edu/
Research Center at San Angelo	Land Use, Water Resources, Economic development	http://sanangelo.tamu.edu/
Research Center at Uvalde	Applied Landscape Ecology Laboratory (ALEL); land use processes wildlife diversity and sustainability.	http://uvalde.tamu.edu/

The deliverable from this set of subtasks will be establishment of a coordinated link to long term research, outreach and education efforts of institutions in South Texas. Reports from TIP can be used not only as source material for sponsors of this program, but also for those in the area unfamiliar with “best practices” for eliminating adverse practices that affect the environment. These on-going programs in South Texas, with their funded studies of natural resources and the environment will complement TIP’s efforts in lowering the environmental footprint of activity, a new issue to the area.

Subtask 6.6 Field Tests – Community Issues

Just as with the previous Subtask, this effort addresses community issues, principally in South Texas, but with applicability to other areas experiencing rapid development of gas shale pays. *Unconventional Gas Social Impact Assessment* (UGSIA) is based on Social impact assessment (SIA), a sub-field of the social sciences, and is a process designed to systematically appraise *in advance* the social impacts of a proposed project or policy change.⁹ Researchers at Sam Houston State University/Utah State University will develop and test a modified version of SIA for affected populations in the Eagle Ford Shale using data gathered from recently conducted sociological studies in the Barnett Shale.¹⁰ Together with ongoing studies in the Uintah Basin, and the Marcellus Shale we will focus on identifying, documenting, and through stakeholder involvement procedures, addressing the broad range of social, cultural, demographic, economic, and social-psychological impacts of proposed gas development in the Eagle Ford Shale.

Deliverables from this task are reports from this modified SIA will provide information to industry and other stakeholders about the types of impacts that need to be considered in any exploration and development decision. In addition, it will provide industry with documentation on the negative social impacts that it needs to minimize and/or avoid. And, by minimizing and/or avoiding such potentially

⁸ <http://agrilifeextension.tamu.edu/programs/agnr/>

⁹ Burdge, Rabel J. 2004. *The Concepts, Process and Methods of Social Impact Assessment*. Middleton, WI: Social Ecology Press.

¹⁰ <http://www.ag.auburn.edu/auxiliary/srsa/pages/Articles/SRS%202009%2024%201%20113-129.pdf>

problematic issues, the energy industry can correct many of the misconceptions surrounding unconventional gas development and, in turn, gain the public's trust.

Subtask 6.7 Field Tests – Air Quality/Emissions

One issue that the energy industry faces is how to minimize adverse environmental impact of their operations. Oak Ridge National Laboratory (ORNL), developers of a networking framework called Sensorpedia,¹¹ will participate with the EFD TIP team in a field trial in the Eagle Ford Shale Play. The objective is to monitor air quality in a selected area, provide data to key stakeholders, and to make sure environmental standards for the area are met. Texas A&M University Kingsville (TAMUK) is joining with (ORNL) in the TIP to develop and implement this new type of environmental oversight program. Selected sensors measure the environmental conditions within a certain area, record those conditions remotely, then process and incorporate that information into the Sensorpedia network for display in real time. Oversight monitoring will be implemented where TIP field tests are being conducted. An ORNL team provides guidance on the parameters to be included in the proposed demonstration of the Sensorpedia EFD network. The TAMUK team will be responsible for monitoring. ORNL sets the boundaries for the data and advises information prioritization and development of baseline and monitoring data for environmental impacts (Tasks 5.1 and 5.2).

A “branded” EFD server will be established at ORNL with basic features to allow users to start seeing data. It is anticipated that the effort, involving acquisition of a server, development of software for EFD's requirements, preparation of data and training of users will take about 6 months following selection of the data to be incorporated, starting later in the first year of the project and continuing into the second year.

This subtask will deliver a prototype environmental oversight package that accepts wide variety of sensor data and through an existing network displays that information in easily understandable manner. The oversight monitoring program is capable of monitoring small or large geographic areas. The subtask will also document the effectiveness of technology being tested in the Eagle Ford Shale proving ground.

Task 7.0 Commercialization of Technologies

Commercialization of the technologies is a key objective of the TIP. Field testing will accelerate the process and afford more opportunities for capital investment by venture capital, private equity, or traditional financing. Traditional business development teaches that there are a number of steps to commercialization – steps that practically all companies follow. The TIP addresses the first steps, getting a process to field trials and evaluating results in the real world. Only then can research programs find licensors and venture capitalists ready to provide capital.

¹¹ <http://www.Sensorpedia.com>

This task provides one of the most valuable portions of the TIP. It establishes a standard for success for the program. The TIP's AVI group applies their collective knowledge of business environments to (1) help select projects (2) review commercialization plans that businesses bring to the program, (3) review field reports and schedules to see if businesses are on track or if there is something not right, and (4) recommend any mid-course corrections if needed.

Deliverables include (1) update briefings at EFD meetings on the success of the TIP effort to commercialize RPSEA technology, (2) reports containing recommendations from a businessman's point of view on how the overall project is progressing (3) final tallying of the combined effort to get maximum benefit from previously funded federal programs.