

**Unconventional Resources Technology Advisory Committee**

**July 14, 2009**

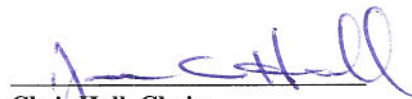
**Ninth Meeting**

**Meeting Minutes**



## Unconventional Resources Technology Advisory Committee

I hereby certify that this transcript constitutes an accurate record of the Ninth Unconventional Resources Technology Advisory Committee Meeting held on July 14, 2009 via teleconference.



**Chris Hall, Chair  
Unconventional Resources  
Technology Advisory Committee**

July 8, 2010

**Date**

A Federal Advisory Committee to the U.S. Secretary of Energy



**Minutes of the Ninth Meeting of  
Unconventional Resources Technology Advisory Committee  
July 14, 2009, Washington, D.C.**

The meeting was called to order by Chris Hall, Committee Chair, at 12:35 PM EST. The Committee Manager (CM), Elena Melchert, DOE, called the roll of committee members and confirmed that a quorum was present (Attachment 1). Others in attendance are listed in Attachment 2. The Chair called upon the Designated Federal Officer (DFO), Guido DeHoratiis, DOE, who reported that Jeff Cline had resigned from the Committee, thus reducing the total URTAC membership from 18 to 17 members. He also reported the resignation of Juliette Falkner, thus reducing the membership from 17 to 16 members.

After reviewing the agenda (Attachment 3), and reporting that no member of the public had requested time on the agenda, the DFO gave a short update on issues related to funding for EPAct, Title IX, Subtitle J. He reported that a final bill by the House Energy & Water Appropriations Sub-Committee did not include language to repeal the Subtitle. He also reported that the House of Representatives voted to defer Fiscal Year 2010 funding for the Subtitle via the House Interior & Related Agencies Appropriations bill, and that the Senate Interior Appropriations bill did not include such language thereby requiring a Conference between the two houses in order to reconcile the issue.

He reported that the Senate Energy bill (S. 1462) included language to divert the funds from the Subtitle J, Ultra-Deepwater Program to conduct an inventory of oil and gas resources on the Outer Continental Shelf. Further, he stated that the House Defense Authorization bill called for repeal of the Subtitle in Fiscal Year 2011. An update of these items will be presented at the next URTAC meeting on September 15, 2009.

The Chair reminded all that the committee had established the Program Review Subcommittee to review the project portfolio and advise the URTAC regarding the balance of the Unconventional Resources Program and the Small Producer Program. Reporting for the Subcommittee, he shared that the Subcommittee had attended a meeting held by NETL to peer review the benefits assessment methodology to be used for assessing the benefits of the Unconventional Resources Program and the Small Producer Program on March 18, 2009.

On April 14, 2009, the Subcommittee attended a RPSEA project review meeting. His notes on the meeting are provided as Attachment 4. He discussed the possibility that RPSEA would open its project review meetings to a larger public audience including industry that could be a good opportunity for technology transfer and for committee member attendance.

He then called upon Gary Covatch, NETL, to give a status update on overall program activities for the Unconventional Resources Program and the Small Producers Program. His detailed presentation is included as Attachment 5.

The Chair asked the members to read the draft *2010 Annual Plan* when it was delivered to them during the week of August 3, 2009 in preparation for the next URTAC meeting, and to provide comments to him and a small organizing Subcommittee prior to the meeting.

Next, Bob Siegfried, representing RPSEA, presented an update on the progress of the Unconventional Resources Program and Small Producers Program, focusing on the progress of the 2007 and 2008 project portfolio (Attachment 6). He described the planning and selection process for the technology-focused projects and resource-focused projects, and the plan for building a critical mass of data within a basin or region. He provided detail on several selected projects.

George Guthrie, NETL, then gave a presentation on the status of the NETL Complementary Research Program (Attachment 7). He described some of the synergies developed between the NETL Complementary Research Program and the cost-shared program administered by RPSEA.

Gary Covatch then presented an update on DOE's responses to the Committee's prior recommendations and also on the Technology Transfer activities (Attachment 8). There was a short discussion as to the importance of technology transfer in making possible the results projected by the benefit assessment project.

The CM then outlined the dates of the next steps for the committee:

- Week of August 3<sup>rd</sup> : Deliver the draft *2010 Annual Plan* to the members
- Sept 15-16, 2009, 10<sup>th</sup> URTAC meeting in San Antonio, TX
- October 15, 2009, 11<sup>th</sup> URTAC meeting in Los Angeles, CA
- October 22, 2009, 12<sup>th</sup> URTAC meeting in Washington, DC

The Committee agreed that members would send their comments regarding the draft *2010 Annual Plan* to the organizing Subcommittee by August 31<sup>st</sup>, in order to facilitate their development of a preliminary strategy for review of the *2010 Annual Plan* during the 10<sup>th</sup> URTAC meeting.

The meeting was adjourned at 4:30 PM.

## Attachments

	<b>Presenter</b>	<b>Topic</b>
1	For the Record	Member Attendance
2	For the Record	Others in Attendance
3	For the Record	Meeting Agenda
4	Mr. Chris Hall	Notes from DOE/NETL Peer Review of Benefits Estimation Methodology Meeting
5	Mr. Gary Covatch	Status Update: Overall Activities for the Unconventional Resources and Small Producers Programs
6	Mr. Bob Siegfried	Offshore Programs Update
7	Mr. George Guthrie	NETL Complementary Research Program
8	Mr. Gary Covatch	NETL Responses to Committee's Recommendations

## **Attachment 1**

### **Committee Members Present**

Chris Hall (Chair)

Jeffery Hall (Vice-Chair)

Don Sparks

Bill Daugherty

Shahab Mohaghegh

James Dwyer

Janet Weiss

Nick Tew

Nancy Brown

Scott Anderson

Bob Hardage

Sandra Mark

Fred Julander

Jessica Cavens

### **Committee Members Not Present**

Sally Zinke

Julie Faulkner

Ray Levey

Jeff Cline (no longer a member)



## **Attachment 2**

### **DOE Staff**

Guido DeHoratiis (DOE- DFO)  
Elena Melchert (DOE)  
Margaret Lou (NETL)  
Gary Covatch (NETL)  
George Guthrie (NETL)  
Chandra Nautiyal (NETL)  
Karl Lang (TMS) (Minutes)  
Rob Matey (TMS) (Audiovisual/Webex)  
Bob Siegfried (GTI-RPSEA)

### **Other Members of the Public**

Ms. Carliane Johnson, environmental consultant for Shell Oil Company  
Andrew Browning, HBW representing the API Oil Shale Task Force  
Peri Ulrey, Director of Economic Analysis, Natural Gas Suppliers Association

## **Attachment 3**



**Department of Energy**  
Washington, DC 20585

**9<sup>th</sup> Meeting**  
**Unconventional Resources Technology Advisory Committee**  
**July 14, 2009 1:00 p.m. EASTERN**  
**WebEx/Conference Call Meeting**  
PUBLIC ACCESS: 955 L'Enfant Plaza North, SW, Suite 1500, Washington, DC

**AGENDA**

- |       |   |   |
|-------|---|---|
| 12:30 | Registration; Begin call in to 800-number and login to WebEx  | Members, Chair, Designated Federal Officer, and Committee Manager |
| 1:00  | Call to Order - Welcome   | Chris Hall, Committee Chair                                       |
|       | Member Roll Call and the presence of a quorum   | Elena Melchert<br>Committee Manager                               |
|       | Meeting purpose and review of the agenda; Insights regarding future funding and other pending legislation; <i>Draft 2010 Annual Plan</i> delivery, and pending meetings in September and October 2009 | Guido DeHoratiis<br>Designated Federal Officer                    |
| 1:25  | Report from the Standing Subcommittee and Member Q/A and Discussion   | Chris Hall<br>Subcommittee Chair                                  |
| 1:45  | Status Update of Section 999 Research Program   | Gary Covatch, DOE/NETL  |
| 2:00  | Status Update of Cost-Shared Program: Overview of 2008 and 2009 activities in the Unconventional Resources Program and the Small Producer Program.  | Bob Siegfried, RPSEA  |
| 2:30  | Member Q/A and Discussion regarding the Cost-Shared Program   | Chris Hall, Committee Chair                                       |
| 2:45  | BREAK   |   |




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PUBLIC ACCESS: 955 L'Enfant Plaza North, SW, Suite 1500, Washington, DC

**AGENDA**

- |      |  |                             |
|------|--|-----------------------------|
| 3:00 | Status Update regarding the NETL Complementary Research Program activities           | George Guthrie, DOE/NETL    |
| 3:10 | Member Q/A and Discussion regarding the Complementary Research Program               | Chris Hall, Committee Chair |
| 3:15 | Status Update of Committee Recommendations with focus on Technology Transfer Program | Gary Covatch, DOE/NETL      |
| 4:00 | Member Discussion on Next Steps  | Chris Hall, Committee Chair |
| 5:00 | Adjourn  | Chris Hall, Committee Chair |

APPROVED:

  
\_\_\_\_\_  
Guido DeHoratiis, Designated Federal Officer

  
\_\_\_\_\_  
Date

## **Attachment 4**

**FROM:** James C. (Chris) Hall  
Chairman, URTAC On-Shore Committee

**DATE:** July 13, 2009

**TO:** URTAC On-shore Committee

**SUBJECT:** 1) March 18, 2009: Notes on DOE/NETL Peer Review of Benefits Estimation Methodology for Unconventional Natural Gas and Small (Mature) Producer Projects  
2) April 14, 2009: Notes on RPSEA Unconventional (On-Shore) Gas Project Review Meeting (Does not include Small Producer Projects)

The following comments were made by the following persons who attended one or more the two conferences and are provided as input to the full committee as part of the program review:

Jessica Cavens, EnCana Oil & Gas  
James C. (Chris) Hall, Drilling & Production Co.  
Shahab Mohaghegh, West Virginia University  
Sally Zinke, Ultra Petroleum

The Committee needs to decide on a mechanism to more fully evaluate the on-going projects. This will become more difficult as the number of projects increases. It has been recommended by several committee members that RPSEA modify their Review Meeting so that it can be made at a public forum which could be attended by members of the oil and gas producing industry. This would allow the producing community to rate the projects, allow the URTAC to evaluate the effectiveness of the program, and serve as a technology transfer event. Representatives of RPSEA have indicated that they are willing to consider such an event.

## **March 18, 2009: Notes on DOE/NETL Peer Review of Benefits Estimation Methodology for Unconventional Natural Gas and Small (Mature) Producer Projects**

### **OVERVIEW:**

DOE held a peer review session in Morgantown, WV on March 18-19, 2009: “Peer Review of Benefits Estimation Methodology for Unconventional Natural Gas and Small (Mature) Producer Projects”. The purpose was for representatives of NETL to present methods they are using to analyze the RPSEA projects that had been awarded in order to determine a measure of the long term benefits, preferably in terms of barrels of equivalent oil/gas production.

### **ATTENDEES:**

1. DOE/NETL representatives, including those staff doing the analysis.
2. Peer Reviewers: Invited to comment on the benefit analysis. Included experts from the oil service industry, producers, state government and academia.
3. Invited Observers: Representing RPSEA and government.
4. Two representatives from the Federal Advisory Committee for the Unconventional Resources/Small Producers portion of the Section 999 Program: Present to observe the process but not to otherwise participate in the conference.

### **COMMENTS/OBSERVATIONS:**

1. DOE through NETL has responded to the need to comprehensively measure the benefits of the Section 999 Program by striving to quantify each project’s benefit in terms of incremental oil and gas production. In some cases this was quantified as accelerated production and not an increase in ultimate recovery.
  - a. The presented techniques by DOE representatives were (probably) the best that anyone could have done given the data and information available to them. The single most important missing item in the assessment process was (and still is, since it has not been addressed) process calibration and validation.
  - b. In some cases the benefits were difficult to quantify in terms of incremental production that was meaningful.
  - c. In some cases the benefit of the accelerated production could be a subject of debate depending on one’s perspective.
  - d. Intangible benefits of the projects were not addressed (i.e.: keeping access to reserves; transferring technology to producers who could then use it in their own operations, etc...). In the past, these measures have not been given little if any value by OMB; they only wanted benefits expressed in terms of added production. Yet, not all projects can be easily quantified.
2. It appeared that some of the NETL work was duplicative of what was already being done (or could be done) by RPSEA. Future coordination of what information was needed by RPSEA and in what format could reduce the amount of duplicative work. For example:
  - a. NETL developed “2 pager” summary business plans for each project that was reviewed. The benefit analysis was conducted on what was contained in the summary. RPSEA had already developed similar materials in their review and

- awarding of contracts. If properly coordinated, RPSEA could provide the necessary information to NETL in the “2 Pager” format which they needed.
3. The problem of which metrics should be used to best evaluate describe projects has always existed. There is no simple answer, although the general consensus is that quantifying the benefits in terms of barrels of equivalent production is best.
    - a. In some cases, are we forced into trying to quantify something that cannot be easily quantified. For example, transferring technology from a project to producers will result in application of the technology that cannot be easily summarized in increased recovery.
    - b. Sometimes the smallest projects yield the greatest benefit in terms of greatest return on investment. However, they might not get the credit they deserve when compared with larger projects that are more impressive.
  4. Additional Points:
    - a. There should be a technology transfer and small producer advocate on the benefits assessment panel, or else projects that focus on those areas will be talked down because the benefits are not as easily quantifiable.
    - b. It is important to have stakeholders involved in the review process who are aware of the particular regional and political challenges. They best know the issues and comment on the assessment process.
    - c. Need output of results that can be understood and valued by diverse groups (not just OMB):
      - i. OMB: technical justification
      - ii. The Hill: policy vision
      - iii. The Industry: end user that will use the technology
    - d. Only “single point” projections were made in the benefits analysis. Since all projects involve risk and unknowns, as range of values representing probabilities should be made in possible rather than single values.
    - e. All projections were made looking forward.
      - i. No attempt was made to look back to historical data that might be used to guide and or validate the results. Looking as past programs could provide considerable information in evaluating benefits of future programs as well as justifying their existence.
      - ii. The presented assessment process could have been calibrated/validated by applying it to the previous data. Previous data refers to projects that had been funded by DOE in the past and some have resulted in major successes several years after the projects were completed. Examples include projects that were funded by DOE during the 1980s and 1990s on fundamentals of flow mechanism and gas production from coalbed methane and shale formations. It seems that DOE/NETL has access to the necessary data and the personnel that can perform this analysis in order to calibrated/validated the process to identify potential shortcomings. During some casual out of meeting conversations, this idea was communicated with the program director (study past projects to calibrate and validate the developed assessment process) and he seemed to be quite favorable. It is interesting to see if any action has been taken.
    - f. The adequacy of Technology Transfer funding continues to be a concern. The



leveraging of the benefit is maximized only if the mechanisms and funding is provided to implement an effective technology transfer program of the program results.

- g. What information on success of R&D funding can be determined from past projects that would give an indication of what can be expected from future funding? Actual case histories could provide metrics of success that might be more credible and accurate than estimates and projections.
- h. Recommend that as part of a project proposal, an estimate of the economic benefit be required.
- i. There needs to be a differentiation between “small producer” needs and benefits and those of larger producers.

**April 14, 2009: Notes on RPSEA Unconventional (On-Shore) Gas Project Review Meeting  
(Does not include Small Producer Projects)**

**OVERVIEW:**

RPSEA held a meeting to have representatives of Unconventional Gas Projects present the status of their individual projects as part of their Advisory Committee oversight responsibilities. The meeting took 1-1/2 days and was followed by a RPSEA Project Advisor Committee Meeting.

**ATTENDEES:**

5. RPSEA Project Advisory Committee.
6. RPSEA Project Representatives.
7. DOE/NETL representatives as observers.
8. Three representatives from the Federal Advisory Committee for the Unconventional Resources/Small Producers portion of the Section 999 Program: Present to observe the process but not to otherwise participate in the conference.

**COMMENTS/OBSERVATIONS:**

1. OVERALL:
  - a. Good turnout; good cross section of industry, academia and interested parties.
  - b. Good interaction among conference attendees.
2. PROS:
  - a. RPSEA obviously looked for a balance in project topic areas. (This was not as evident in terms of geographical balance). Note that much of the balance was based on the URTAC matrix of suggested topic expansion.
  - b. The oversight by the RPSEA Project Advisory Committee members was very good. They were very engaged in the review process. Their membership represented a good cross section of the industry (producers, service companies, both large and small companies).
  - c. The material was very well presented. There was significant interaction between the presenters and the audience. Much was learned by everyone involved. The presenters themselves learned information that was valuable to their research.
  - d. It was realized during the conference that some material had applicability to regions of the country that was not initially considered (i.e.: from gas reservoirs to oil reservoirs). This expands the technology transfer component of the project that needs to be implemented.
3. CONS:
  - a. Project focus was not geographically diverse, but was concentrated in mid-continent regions of the country. Often “regional credit” was taken for where project awardees were located (i.e.: Lawrence Livermore was credited as being a California project, although the field it was addressing was located elsewhere and the topic had absolutely no California application.) This would have to be balanced by an effective national technology transfer program.
  - b. Often, the size, duration, cost and matching fund requirements (cost share) of the project were not presented. There was a comment made that cost estimates were

not included in the original solicitation information, but were deferred until project selection. This could generate “pie in the sky” facets that were part of original proposal but are not achievable at funding level.

- c. At times, projects are being done without specific field level partnerships; information and material such as the availability of core samples and data was a problem. There is a need for reality check against industry needs and practices as well as a need to quantify metrics like increased productivity.
- d. Too many of the projects did not mention the Technology Transfer component of their research unless it was specifically asked about.

#### 4. RECOMMENDATIONS:

- a. Greater effort needs to be made to ensure that project and technology transfer efforts will meet the objective of maximum national exposure.
- b. Need more peer review of the presentations with critical questions. Often the questions were just informational; need a thesis type critical analysis by participants.
- c. Need to involve the industry in the project reviews. This would increase the technology transfer element and provide industry field level expertise. It was evident that at times the labs that are doing the research were not aware of field conditions and needs.
- d. Have a “1 Pager” summary of each project that provides specific information in a common format that can be used by DOE and reviewers to better understand the specifics of each project.

It would also be beneficial to have a rating sheet that focuses on project accomplishments such as deliverables, progress, tasks, timing, tech transfer, and budget. The presentations/projects that provided a summary or check list related to these items were the most effective.

- e. There is an absolute need to foster collaboration of information with and between the labs, industry and the field. Recommend open and public peer review of the projects with a rating system so that the value and effectiveness of each can be better determined.
- f. All projects should be tied to field so as to ensure the applicability and validity of the research. Sources of core samples and data should be facilitated by RPSEA, the DOE/NETL or other industry groups.
- g. It should be required that each project demonstrate that they have established industry partnerships in the following areas so as to ensure the applicability and end use of the research: Mentors, interested parties and end users. RPSEA needs to proactively ensure that this is achieved.
- h. It would be extremely beneficial to open the review conference to the public in the form of an industry workshop. This would stimulate discussion, feedback, more critical evaluation and technology transfer to the ultimate end users.
- i. The method of Technology Transfer must be discussed as part of every project presentation. It should cover how the project material will be prepared, to whom it will be presented and how it will be made available to nation dissemination. Without success in this area of the project, the R&D will not achieve its full potential.

## **Attachment 5**



**Status Update: EPL Act 2005 Title IX, Subtitle J  
Section 999 – Project NT42677, “Ultra-Deepwater  
and Unconventional Natural Gas and Other  
Petroleum Resources Program**

Gary L. Covatch  
Project Manager, Natural Gas & Oil Project Management Division



May 27, 2009

## URTAC Update Presentation Outline

- **Overview**
  - Program Goal
  - Program Funding Distribution
  - Consortium Accomplishments
- **Unconventional Gas and Small Producer RFP Summary**
  - 2007
  - 2008
- **2009 Funding Disbursement History**
- **2009 Program / Process Enhancements**
  - Contractual / GAO
  - Risk Mitigation / Management
  - Communication Meetings
- **2010 Annual Plan Timeline**

## Program Accomplishments

### *Solicitations & Awards*

#### **Accomplishments:**

- 3 Annual Plans completed
- 15 solicitations released under 2007 R&D funding
- 43 projects selected for award under 2007 solicitations
  - 17 Ultra-Deepwater projects
  - 19 Unconventional Resources projects
  - 7 Small Producers projects

## Program Accomplishments

### *Solicitations & Awards*

#### **Current Status:**

- Initial projects just underway
- 69 proposals received under 2008 Unconventional Resources RFP
  - 9 selections approved
- 23 proposals received under 2008 Small Producers RFP
  - 6 selections approved, 1 subcontract awarded (7/8/09)
- 27 proposals received under 11 UDW RFPs
  - 3 selections approved
- 7 solicitations planned to be released late Summer 2009
  - 5 Ultra-deepwater (\$14.8 million)
  - 1 Unconventional Resources (\$13.7 million)
  - 1 Small Producers (\$3.2 million)

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2

NATIONAL ENERGY TECHNOLOGY LABORATORY

## Unconventional Gas RFP Activity 2007

- |  |                 |
|--|-----------------|
| • RFP released                                 | Oct. 17, 2007   |
| • RFP closed                                   | Dec. 3, 2007    |
| • RFP selections submitted to NETL             | Mar.1, 2008     |
| • NETL approves 19 selections for RFP          | Mar. 11, 2008   |
| • RPSEA awards 1 <sup>st</sup> R&D subcontract | July 28, 2008   |
| • Last subcontract awarded                     | April 29, 2009* |

\* Award delayed as PI changed Universities

2

NATIONAL ENERGY TECHNOLOGY LABORATORY

## Small Producer RFP Activity 2007

- RFP Released Oct. 17, 2007
- RFP Closed Dec. 3, 2007
- RFP selections submitted to NETL for approval Jan. 25, 2008
- NETL approves 7 projects for selection Feb. 1, 2008
- RPSEA awards 1<sup>st</sup> R&D subcontract June 2, 2008
- Last subcontract awarded Sept 3, 2008

## Unconventional Gas RFP Activity 2008

- RFP released Nov. 11, 2008
- RFP closed Jan. 12, 2009
- RFP selections submitted to NETL Mar.1, 2008
- NETL approves 9 selections Mar. 28, 2009



## Small Producer RFP Activity 2008

- RFPs Released Nov. 11, 2008
- RFPs Closed Jan. 12, 2009
- RFPs Selection submitted Mar. 26, 2009
- NETL approves 6 selections Mar. 28, 2009



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## 2009 Funding Disbursement History

- **November 6, 2008: 2009 Annual Plan submitted to Secretary of Energy**
- **December 22, 2008: NETL obligates \$1,000,000 to RPSEA contract**
- **January 13, 2009: Annual Plan approved**
- **January 27, 2009: Annual Plan published in Federal Register**
- **February 11, 2009: Remainder of FY09 funding arrives at NETL**
- **March 4, 2009: Remainder of FY09 Funds obligated to RPSEA contract**

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## **2009 Program / Process Enhancements - Contractual / GAO**

- RFP templates developed
- Subcontract templates developed
- Streamlined proposal submission process
- Hold Contracting Process Overview Meeting prior to solicitation release
- Use secure FTP site to distribute proposals to reviewers
- NETL's technology transfer program inclusive of RPSEA – Comprehensive Tech Transfer Program
- Streamlined Subcontract Approval Process
- Benefits methodology developed
- **Added documentation to address GAO comment on whether this work would be done without government funding.**

## **2009 Program / Process Enhancements - Risk Mitigation / Management**

- Annual Plan Schedule developed for optimal program continuity, i.e., minimal delays in funding
- Houston Area Office opened
- Continuous dialogue with RPSEA
- Blanket waiver received for Intellectual Property
- NETL Begins Development of comprehensive metrics for Offshore and Onshore Programs synergistic with Technology Transfer effort

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- **2010 Annual Plan Timeline**

12

NATIONAL ENERGY TECHNOLOGY LABORATORY

## Questions



13

NATIONAL ENERGY TECHNOLOGY LABORATORY

## **Attachment 6**



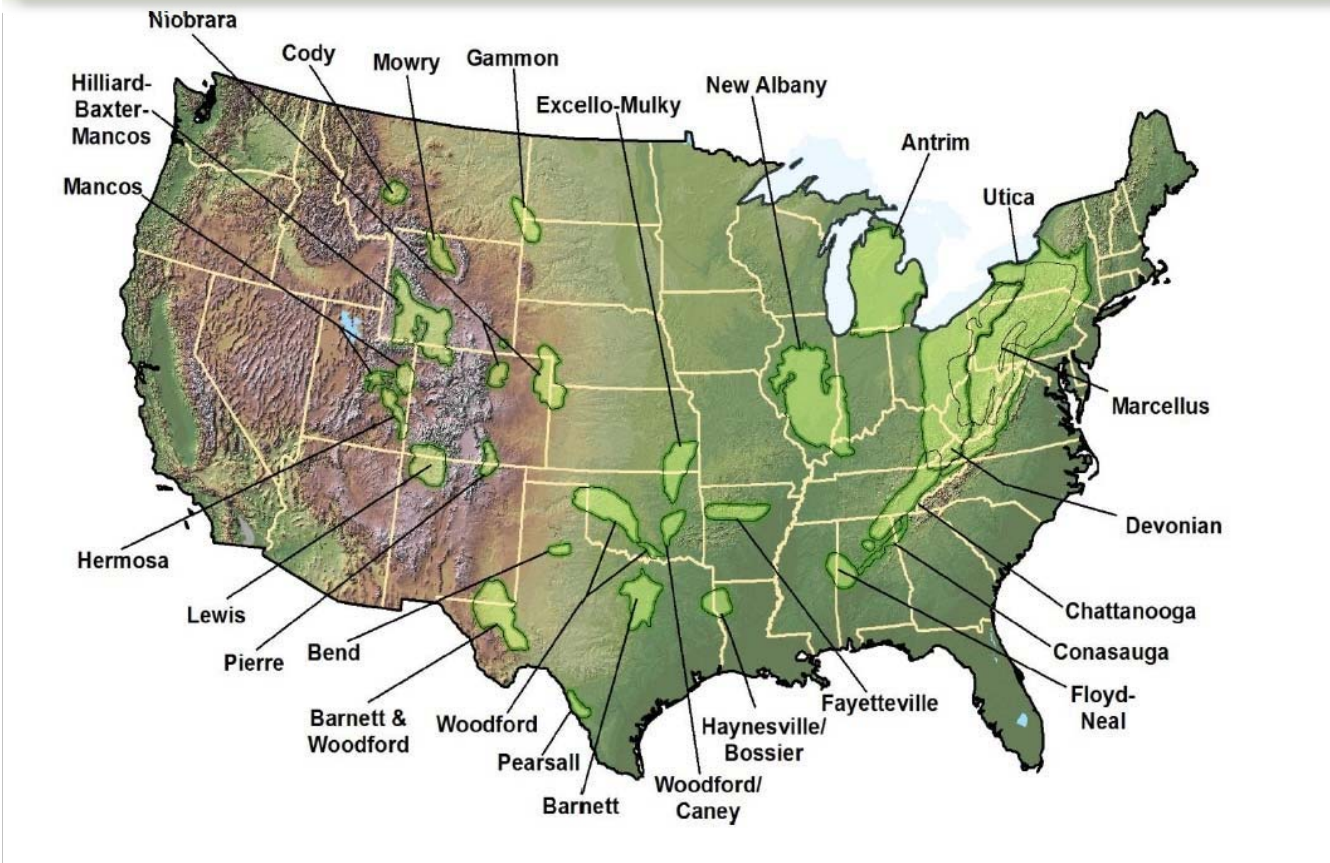
**Onshore Programs Update**  
July 14, 2009

**Secure Energy for America**

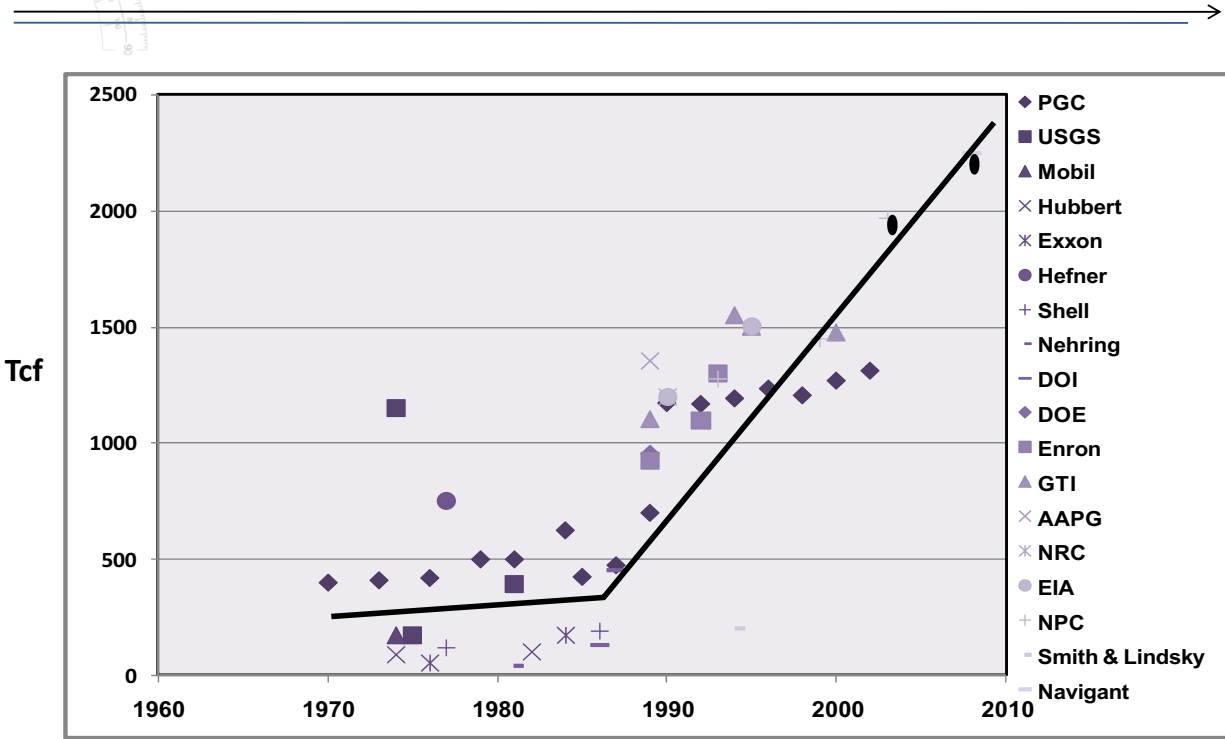
## **Onshore Programs**

- **Unconventional Resources**
  - Resource Target
  - Approach
  - Status of selected projects
- **Small Producer**
  - Objective
  - Approach
  - Status of selected projects

# Unconventional Gas Basins 293 Tcf - Technically Recoverable Gas Resource



## U. S. Technically Recoverable Gas Resource Base - Tcf



# Unconventional Gas

- **Potential to Impact National, International Energy Supply**
  - Abundant
  - Low carbon
  - Suitable for transportation and power generation
- **Technical Challenges**
  - Cost
  - Environmental impact of development
  - These challenges are closely related

## Unconventional Onshore Themes

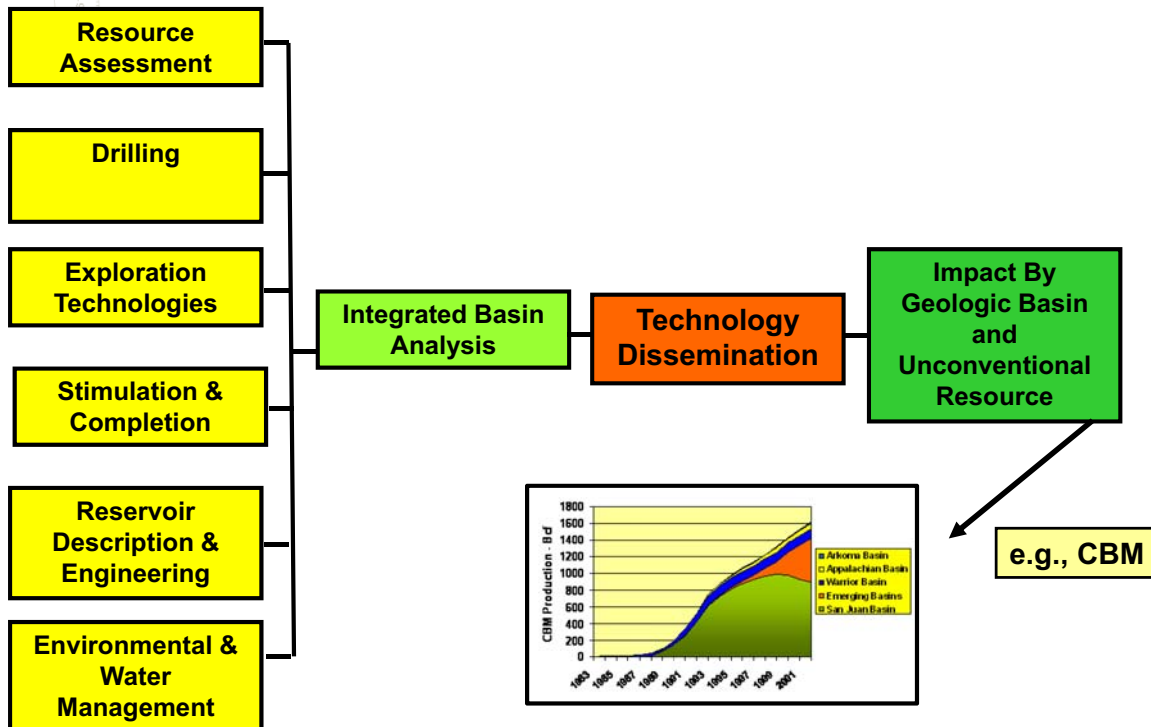
- **Gas Shales**
  - Rock properties/Formation Evaluation
  - Fluid flow and storage
  - Stimulation
  - Water management
- **Coalbed Methane**
  - Produced water management
- **Tight Sands**
  - Natural fractures
  - Sweet spots
  - Formation Evaluation
  - Wellbore-reservoir connectivity
  - Surface footprint

**Cost Reduction  
in All Aspects of  
Operations**





# RPSEA Unconventional Gas Program Components & Approach



Secure Energy for America

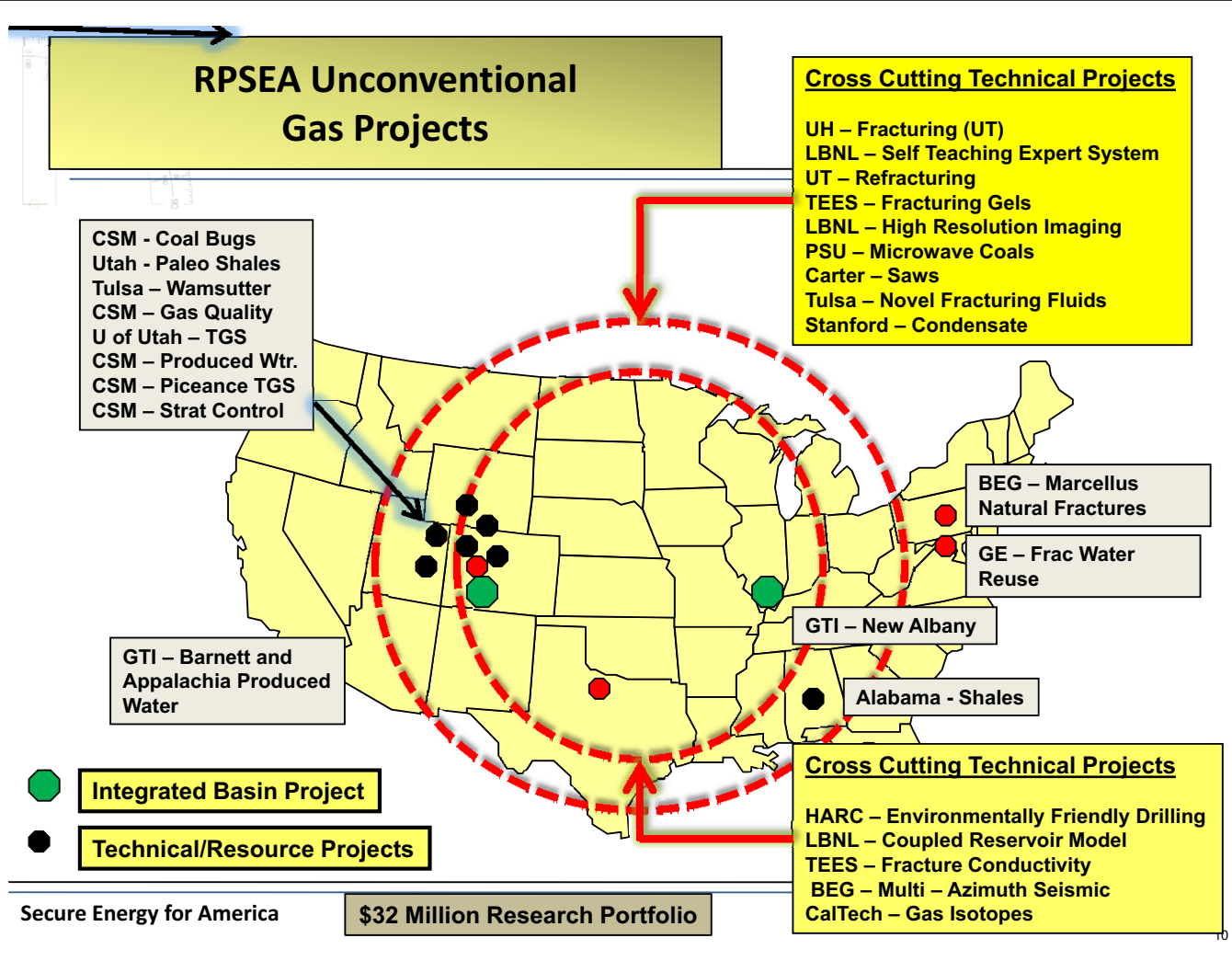
	CBM 10%	Gas Shales 45%	Tight Sands 45%
Integrated Basin Analysis	High Priority	High Priority	High Priority
Drilling	High Priority	High Priority	High Priority
Stimulation and Completion	High Priority	High Priority	High Priority
Water Management	High Priority	High Priority	High Priority
Environmental	High Priority	High Priority	High Priority
Reservoir Description & Management	High Priority	High Priority	High Priority
Reservoir Engineering	High Priority	High Priority	High Priority
Resource Assessment	High Priority	High Priority	High Priority
Exploration Technologies	High Priority	High Priority	High Priority

H
M
L

High Priority  
Medium Priority  
Low Priority

Total Cost to RPSEA

	CBM 10%	Gas Shales 45%	Tight Sands 45%	
Integrated Basin Analysis		New Albany (GTI) \$3.4	Piceance (CSM) \$2.9	\$6.3
Drilling				\$0.0
Stimulation and Completion	Microwave CBM (Penn) \$.08	Cutters (Carter) \$.09 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95 Frac Cond (TEES) \$1.6	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22	\$4.7
Water Management	Integrated Treatment Framework (CSM) \$1.56	Barnett & Appalachian (GTI) \$2.5	Frac Water Reuse (GE) \$1.1	\$5.2
Environmental	*	Environmentally Friendly Drilling (HARC)* \$2.2	*	\$2.2
Reservoir Description & Management		Hi Res. Imag. (LBNL) \$1.1 Gas Isotope (Caltech) \$1.2 Marcellus Nat. Frac./Stress (BEG) \$1.0	Tight Gas Exp. System (LBNL) \$1.7 Strat. Controls on Perm. (CSM) \$0.1	\$5.1
Reservoir Engineering		Decision Model (TEES) \$.31 Coupled Analysis (LBNL) \$2.9	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52	\$5.3
Resource Assessment		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67	\$1.6
Exploration Technologies	Coal & Bugs (CSM) \$.86	Multi-Azimuth Seismic (BEG) \$1.1		\$2.0
2008 Program Priorities		\$2.5	\$20.0	\$9.8
		H M L	High Priority Medium Priority Low Priority	2007 Projects 2008 Projects
				\$32.3



## Significant Producer and Service Industry Involvement – Crucial for Program Relevancy

- Anadarko
- Chevron
- Pioneer Natural Resources
- Williams E&P
- ConocoPhillips
- ExxonMobil
- Newfield Exploration
- NGAS
- Encana
- BP
- Bill Barrett Corp.
- Pinnacle Gas Resources
- Coleman Oil & Gas
- Ciris Energy

- Devon Energy
- Unconventional Gas Resources Canada
- Whiting Petroleum
- CNX Gas
- Trendwell
- Diversified Operating Corp
- Noble Energy
- Jones Energy
- Aurora Oil & Gas

- Schlumberger
- Halliburton
- Pinnacle Technologies
- BJ Services
- Carbo Ceramics

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11



- **Research  
Partnership to  
Secure Energy  
for America**

### *Project Highlights*

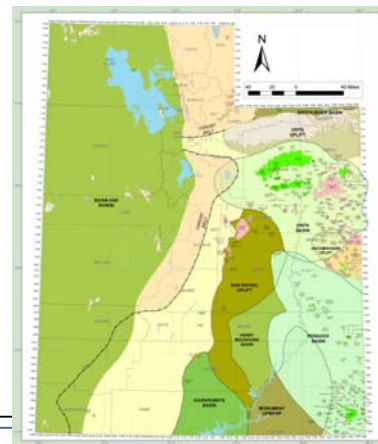
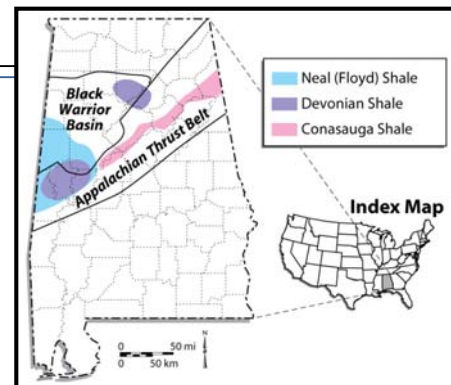
**Unconventional Onshore Program**

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12

# Shale Resource Assessment

- **Alabama – Geological Survey of Alabama**
  - Neal (Floyd) Shale, Conasauga Formation, Devonian Shale
  - Each have technical challenges/how to address?
  - See Spring 2009 NETL “E&P Focus”
- **Utah – Utah Geologic Survey**
  - Manning Canyon, Delle Phosphatic, Paradox Shale resources
  - Evaluate potential
  - Requirements for economic production



## Paleozoic Shale-Gas Resources of the Colorado Plateau and Eastern Great Basin, Utah: Multiple Frontier Exploration Opportunities – Utah Geologic Survey

### *Project Goal*

**Provide basin specific analyses of shale-gas reservoir properties to develop the best local completion practices that can be applied to the emerging Manning Canyon, Delle Phosphatic, and Paradox frontier gas shales.**

### *Objectives*

- Identify and map the major trends for frontier gas shale
- Identify areas with the greatest gas potential
- Characterize the geologic, geochemical, petrophysical, & geomechanical rock properties
- Reduce exploration costs & drilling risk especially in environmentally sensitive areas
- Recommend the best practices to complete & stimulate frontier gas shales to reduce development costs & maximize gas recovery

# Timing and Major Milestones

Technical Tasks	2008		2009				2010				2011	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Task 1.0. Project Management Plan	•	•	•	•	•	•	•	•	•	•	•	•
Task 2.0. Technology Status Assessment	•											
Task 3.0. Technology Transfer	•	•	•	•	•	•	•	•	•	•	•	•
Phase I												
Task 4.0: Data Compilation.	•	•	•									
Task 5.0: Core and Cuttings Examination and Sample Analysis		•	•	•	•	•	•	•				
Task 6.0: Outcrop Examination and Sample Analyses		•	•	•	•	•	•	•				
Phase II												
Task 7.0: Determination of Best Completion Practices				•	•	•	•	•	•	•	•	•
Task 8.0: Regional Correlation, Mapping, and Depositional History Determination					•	•	•	•	•	•		
Task 9.0: Final Interpretations and Recommendations							•	•	•	•	•	•

# Technical Advisory Board

- Shell E & P Company



- Sinclair Oil and Gas Company



- Encana Oil and Gas USA, Inc.



- Bill Barrett Corporation



- CrownQuest Operating, LLC

- ST Oil Company

# Tech Transfer

- Two presentations at AAPG, June 2009
  - *Shale Gas and Shale Oil Resources of the Paradox Basin, Colorado and Utah*, by Steve Schamel
  - *Gas Shale Characteristics from the Pennsylvanian of Southeastern Utah, USA*, by S. Robert Bereskin and John McLennan

**PALEOZOIC SHALE-GAS RESOURCES OF THE COLORADO PLATEAU & EASTERN GREAT BASIN, UTAH: MULTIPLE FRONTIER EXPLORATION OPPORTUNITIES**

FUNDED BY—RESEARCH PARTNERSHIP TO SECURE ENERGY FOR AMERICAN (RPSEA) UNCONVENTIONAL ONSHORE PROGRAM

GEOLOGY.UTAH.GOV/EMP/SHALEGAS

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**MISSISSIPPIAN MANING CANYON SHALE & DELLE PHOSPHATIC SHALE MEMBER**

**Objectives**

**Project Goals**

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**PENNSYLVANIAN PARADOX FOR ATION**

**Location of the Paradox Formation in the Eastern Paradox Basin of Utah and Colorado**

**Location of the Paradox Formation in the Eastern Paradox Basin of Utah and Colorado**

**Paradox Formation Stratigraphic Chart for the Paradox Basin**

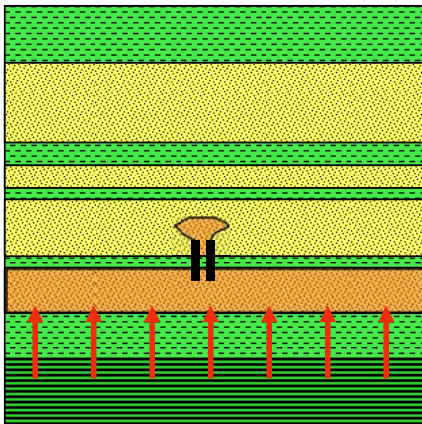
Funded by RPSEA, with Geological Services, Saltwater, Salt Consulting, Inc., and Bereskin & Associates

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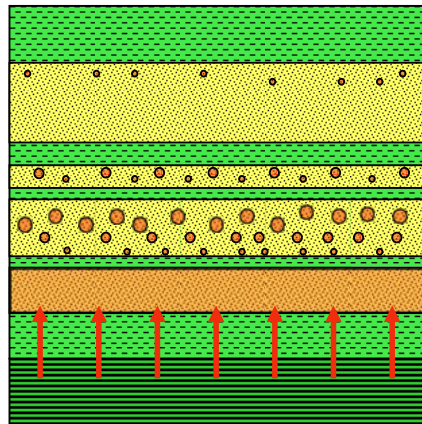
## How Does Gas Migrate into and Fill Unconventional Reservoirs?

Different Mechanisms Should Leave Different Signatures in the Gas Composition; Assisting with Exploration Strategy

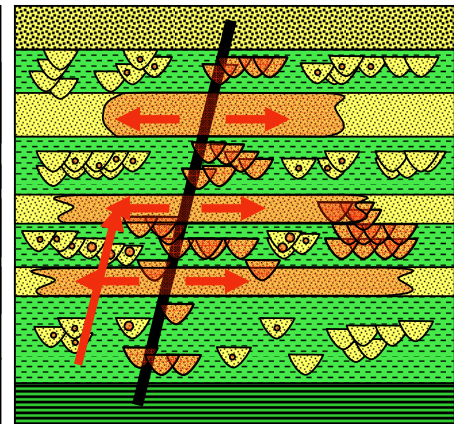
Gas pressure Produces Fractures



Gas Diffuses Through Seals



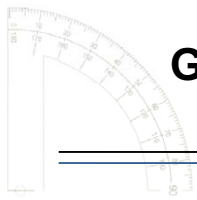
Gas Migrates Along Faults



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Colorado School of Mines





# Gas Migration into Unconventional Reservoirs

## Colorado School of Mines

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### Progress to date:

Technology status document submitted.

Project website is online, with resources for the general public.

Analysis of gas samples – underway.

- Initial set of bulk gas and compound-specific isotopic analyses – complete.

Migration modeling – underway

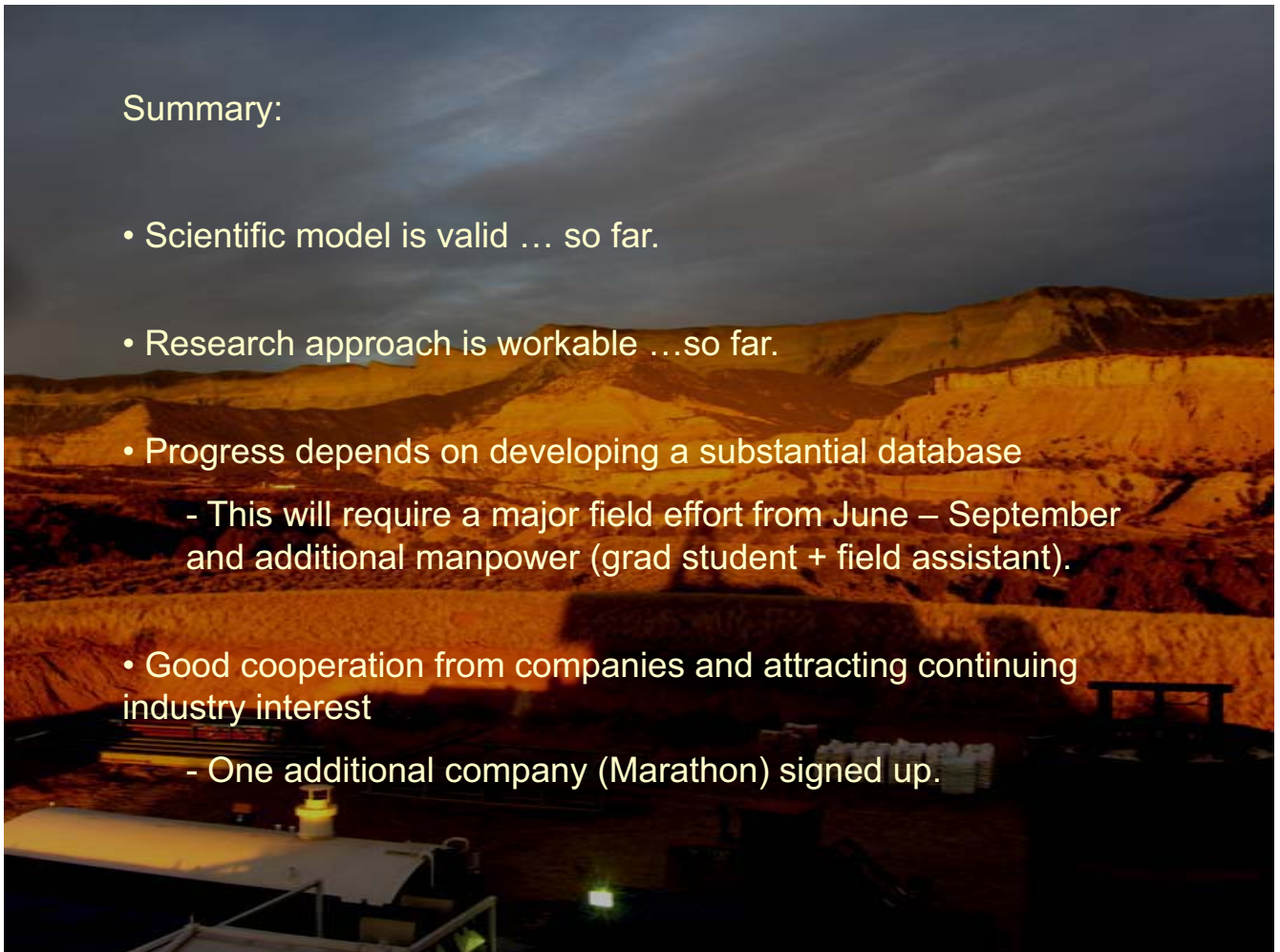
- Training in MPath is complete.
- Ph.D. student now developing a preliminary migration model for Jonah Field.

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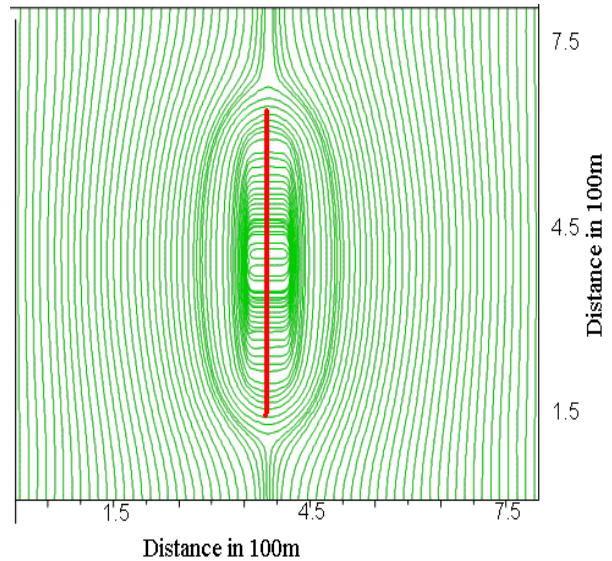
### Summary:

- Scientific model is valid ... so far.
- Research approach is workable ...so far.
- Progress depends on developing a substantial database
  - This will require a major field effort from June – September and additional manpower (grad student + field assistant).
- Good cooperation from companies and attracting continuing industry interest
  - One additional company (Marathon) signed up.



# Identification of Refracturing Opportunities

- Methodology for candidate well selection based on poro-elastic models and analysis of field data.
- Recommendations for the time window most suitable for re-fracturing
- Re-fracture treatment design for horizontal and deviated wellbores



**Stress Profile Created by Horizontal Producing Well**

University of Texas

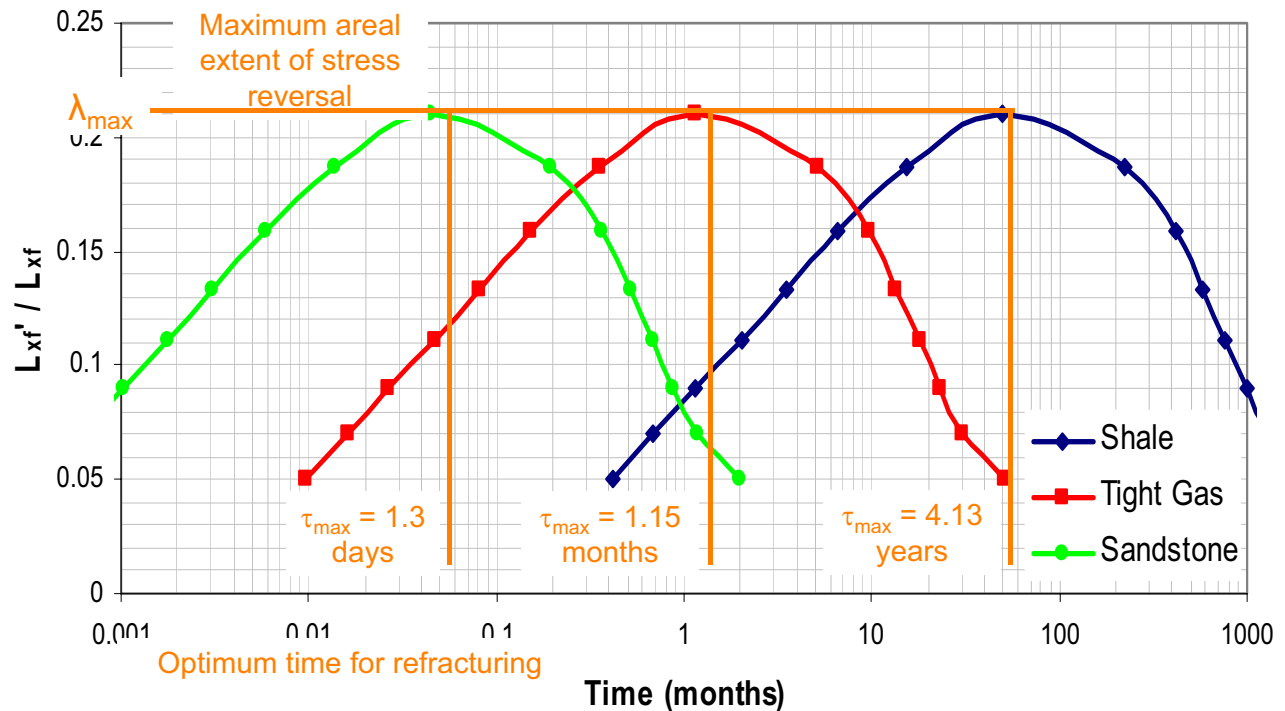
21

## Objectives

- Use principal component analysis to determine the increase in production rate after a refracture treatment.
- Use stress reorientation models to study the role played by stress reorientation vs other factors such as GOR and depletion.
- Use these findings to recommend timing for refracs
- Create a statistical, predictive model for
  - ✓ Production enhancement
  - ✓ Candidate well selection



# Selecting Timing and Candidate Wells for Re-fracturing



## Summary of Progress to Date

- Stress reorientation due to poroelastic effects has been calculated for vertical, fractured and horizontal wells.
- Key parameters and conditions that control this stress reorientation have been identified.
- The optimum timing of refrac treatments has been computed for the first time.
- A data set of refrac treatments from the Wattenburg field has been reviewed and is being analyzed for statistical trends.
- Review of refrac treatment designs in progress.

# Unconventional Resources Program

- **All Projects Reviewed with PAC, April 2009**
  - **Critical review by PAC**
  - **Review by PI Group**
  - **Communication among PIs**
  - **Identify opportunities for cooperation**
  - **Provide direction for draft Annual Plan**

## The Technology Challenges of Small Producers

### Focus Area – Advancing Technology for Mature Fields

- **Target – Existing/Mature Oil & Gas Accumulations**
  - Maximize the value of small producers' existing asset base
  - Leverage existing infrastructure
  - Return to production of older assets
  - Minimal additional surface impact
  - Minimize and reduce the existing environmental impact
- **Lower cost and maximize production**





## 7 Small Producer Projects Funded in 2007

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- **Cost Effective Treatment of Produced Water Using Co-Produced Energy Sources for Small Producers**
- **Enhancing Oil Recovery from Mature Reservoirs Using Laterals and High-volume Progressive Cavity Pumps**
- **Reducing Impacts of New Pit Rules on Small Producers**
- **Field Site Testing of Low Impact Oil Field Access Roads: Reducing the Footprint in Desert Ecosystems**
- **Near Miscible CO<sub>2</sub> Application to Improved Oil Recovery for Small Producers**
- **Preformed Particle Gel for Conformance Control**
- **Seismic Stimulation to Enhance Oil Recovery**

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## Field Site Testing of Low Impact Oil Field Access Roads: Reducing the Footprint in Desert Ecosystems

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**Project Leader: Texas A&M University**

**Additional Project Participants: Rio Vista Bluff Ranch and Halliburton**

### *The Problem:*

Intensive development within existing fields requires more infrastructure and road-building. This can increase costs, regulatory requirements, and environmental impacts.

### *Project Goals:*

- **Create an industry desert test center where new technology can be evaluated under controlled conditions in a field environment**
- **Build a test track simulating a minimal impact O&G lease road**
- **Analyze the performance of various products used in test sections and perform an economic analysis to measure applicability of the alternate systems**

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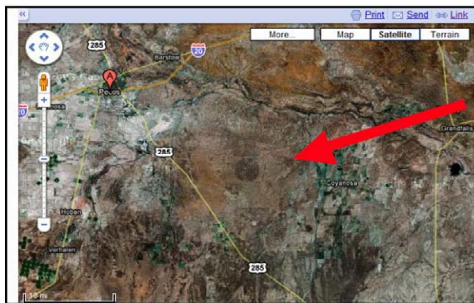
## Field Site Testing of Low Impact Oil Field Access Roads: Reducing the Footprint in Desert Ecosystems

Web site has been established at

<http://sites.google.com/a/pe.tamu.edu/low-impact-access/Home/low-impact-access-roads-demonstration>

A test road location has been selected, and a detailed schedule has been prepared.

Road sections will be laid out alongside but offset from the existing gravel track because we want to see how the test sections will work on unprepared soil and ultimately how easily they can be remediated.



The Pecos Research and Testing Center is located Southeast of Pecos Texas, approximately 1.5 hour drive from the Midland/Odessa airport.

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## Cost Effective Treatment of Produced Water Using Co-Produced Energy Sources for Small Producers

### Approach:

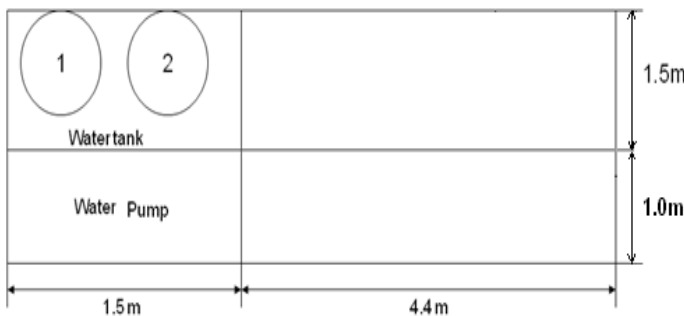
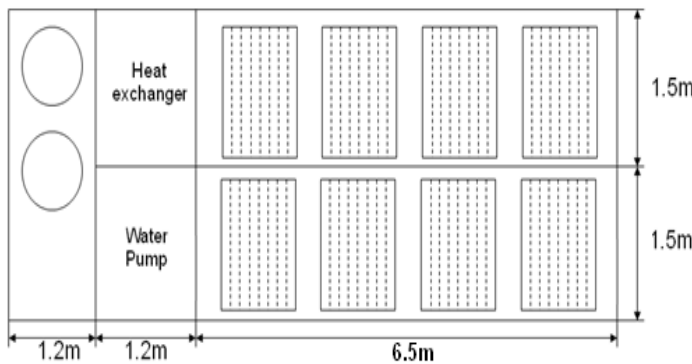
1. Process has been optimized for enhanced water recovery and energy efficiency
2. Researchers have designed the optimized process for demonstration
3. Produced water direct heating by solar energy has been designed
4. On-going work includes equipment procurement and on site preparation for demonstration

# Laboratory Test and Process Optimization



Composition	Feed water	Purified water	Removal efficiency, %
Total dissolved solid (TDS), mg/L	19756.0	76.35	99.6
Total suspended particulates, mg/L (0.22 $\mu$ m < dia. < 100 $\mu$ m)	99.6	Undetectable	100%
Total organic carbon (TOC), mg/L	470.2	17.83	96.2%

## Site Preparation and Demonstration Preparation



**Planned Site for Water Treatment**

# 2008 Small Producer Project Selections

## Reservoir Characterization

Lead Organization	Title	Partners	Main region	Total Cost	Cost Share	Duration
University of Texas of the Permian Basin	Commercial Exploitation and the Origin of Residual Oil Zones: Developing a Case History in the Permian Basin of New Mexico and West Texas	Chevron, Legado Resources, Yates Petroleum	Permian Basin	\$962,251	34	2 years
Western Michigan University	Evaluation and Modeling of Stratigraphic Control on the Distribution of Hydrothermal Dolomite Reservoir away from Major Fault Planes	Polaris Energy Company	Michigan	\$1,138,864	65	2 years
UT Austin - Bureau of Economic Geology	Development Strategies for Maximizing East Texas Oil Field Production	Danmark Energy, John Linder Operating	Texas	\$1,969,890	50	3 years

# 2008 Small Producer Project Selections

## Oil and Gas Recovery

Lead Organization	Title	Partners	Main region	Total Cost	Cost Share	Duration
New Mexico Institute of Mining and Technology	Mini-Waterflood: A New Cost Effective Approach to Extend the Economic Life of Small, Mature Oil Reservoirs	Armstrong Energy	Southwest	\$1,107,659	71	2 years
Layline Petroleum 1, LLC	Field Demonstration Of Alkaline Surfactant Polymer Floods In Mature Oil Reservoirs Brookshire Dome, Texas	Tiorco, University of Texas at Austin	Mid-Continent	\$1,226,396	51	2 years

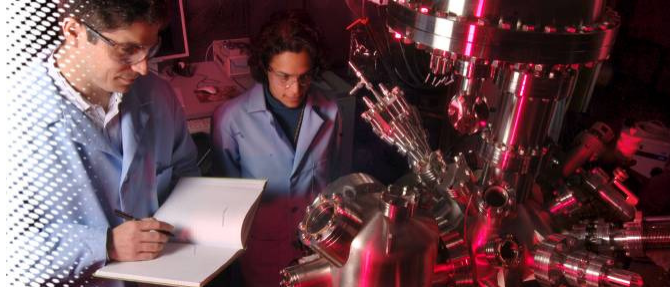
# 2008 Small Producer Project Selections

## Utilizing Waste to Increase Efficiency

Lead Organization	Title	Partners	Main region	Total Cost	Cost Share	Duration
Gulf Coast Green Energy	Electrical Power Generation from Produced Water: Field Demonstration of Ways to Reduce Operating Costs of Small Producers	Denbury Resources, ElectraTherm Inc, Dry Coolers Inc.	Gulf coast	\$431,344	50	3 years

## **Attachment 7**





## NETL's Complementary Research Program

George Guthrie

Geological and Environmental Systems Focus Area

Office of Research & Development



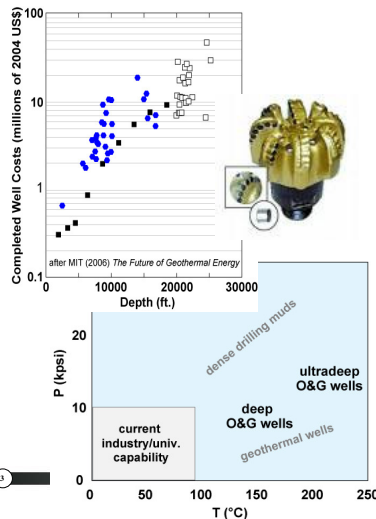
ORD Overview, November, 2009

## Primary Research Areas for NETL's Complementary Program

- **Drilling under extreme conditions**
  - experimental facility; materials development/testing; computation
- **Environmental impacts of oil/gas productions**
  - produced water management: data collection, management, assessment
  - air quality: improved reliability and accuracy of predictions (data collection; model development)
  - ecological impacts: improved assessments through novel sensors
  - unconventional fossil production: identification and assessment of potential barriers
- **Unconventional oil and enhanced oil recovery**
  - CO<sub>2</sub> enhanced oil recovery: control of CO<sub>2</sub> viscosity
  - in-situ oil shale production: tunable microwaves with CO<sub>2</sub>; environmental barriers
  - oil production from fractured media (e.g., shales): improved reliability and accuracy of predictions for multiphase flow in Bakken
- **Resource assessment; geospatial data management**
  - knowledge management database development
  - high resolution data on Marcellus shale for improved assessment

## Drilling under Extreme Conditions

**Goal: To improve the economics of drilling deep and ultra-deep wells by increasing the rate of penetration and by developing better-performing materials for extreme drilling environments**



### Four Elements to Research Focus

- Experimental investigation of drilling dynamics
  - Ultra-deep Drilling Simulator (UDS) and the Extreme Drilling Laboratory
- Development of predictive models for drilling dynamics
- Development of novel nanoparticle-based fluids for improved drilling
- Improvement of materials behavior/performance in extreme environments

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## Drilling under Extreme Conditions

*Status*

- Experimental investigation of drilling dynamics
  - Completed facility mods and equipment procurement for extreme drilling lab
  - Installation of UDS at NETL completed; pressure vessel proof tested
  - Initiated shakedown of UDS
  - Baseline testing to begin in early fall 2009
    - Validate single cutter relative to multi-cutter
    - Extend full bit simulation to elevated PT
    - Initiate testing matrix of drilling fluids with model rock system
- Development of predictive models for drilling dynamics
  - Discrete-element & continuum-scale models under development to predict reaction forces on bits & rock fragmentation; validation with future UDS data
  - CFD model of filter cake formation under development; validation with future UDS results; baseline comparison with commercial code (ANSYS Fluent)
- Development of novel nanoparticle-based fluids for improved drilling
  - Demonstrated nanoparticle haloing to stabilize colloidal barite suspensions
  - Demonstrated hydrophobic nanoparticles stabilize inverted emulsions
- Improvement of materials behavior/performance in extreme environments
  - Key failure mechanisms in Cl- and H<sub>2</sub>S-environments identified via industry
  - Ambient-pressure fatigue testing initiated for corrosion fatigue (H<sub>2</sub>S)
  - Completed design of HPHT fatigue test unit; procurement/installation initiated

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## Environmental Impacts of Oil/Gas

**Goal:** To develop an improved, science-base understanding that leads to solutions for potential environmental challenges to oil/gas production



### Major Elements to Research Focus

- Evaluation of strategies for effective and environmentally sound disposition of produced waters
  - Produced water database (PWMIS)
  - Evaluation of potential options (subsurface drip irrigation; ephemeral streams)
  - Quantitative models via a portfolio of monitoring options (airborne, UAV, hyperspectral, electromagnetic, LIDAR, etc.)
- More accurate assessment of air-quality impacts by detailed measurement and improved computational representations

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## Environmental Impacts of Oil/Gas

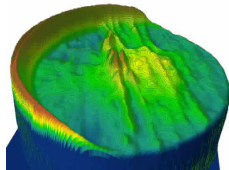
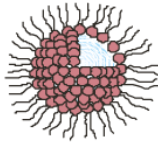
*Status*

- **Produced Water**
  - Expanded the on-line Produced Water Management Information System (PWMIS); averaging ~6000 hits/month
  - Continued monitoring & independent evaluation of subsurface drip irrigation
    - Fall and mid-winter electromagnetic-conductivity surveys; meteorological station installed; groundwater wells sampled
    - Planned 5-yr study, unless site equilibrium is attained earlier
    - Sufficient divalent cations in groundwater and soil minerals to counteract impact of high-SAR produced water at least in the short term; too early to assess potential impact on groundwater flow
- **Air Quality**
  - Completing construction of mobile air monitoring station; to be deployed in Allegheny National Forest in Q3 FY09
    - Will provide site-specific data for improving accuracy and reliability of predictive atmospheric-dispersion and source-receptor models
  - Developing wireless monitoring network and unmanned aerial vehicle (UAV) platforms for efficient and effective site monitoring

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## Unconventional Oil & Enhanced Oil Recovery

**Goal:** To enable broader utilization of domestic fossil resources through improved efficiency and lowered environmental impact



### Four Elements to Research Focus

- **CO<sub>2</sub>-enhanced oil recovery:** Improved flow control by increasing CO<sub>2</sub> viscosity (tailored surfactants)
- **In-situ production of oil shale:** Improved heating of kerogen by tuned microwave and CO<sub>2</sub>; environmental impacts
- **Oil production in fractured media:** Improve accuracy/reliability of predicting primary–tertiary oil recovery in shale
- **Catalog experience/knowledge from oil-shale and tar-sand activities**

7

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## Unconventional Oil & Enhanced Oil Recovery

*Status*

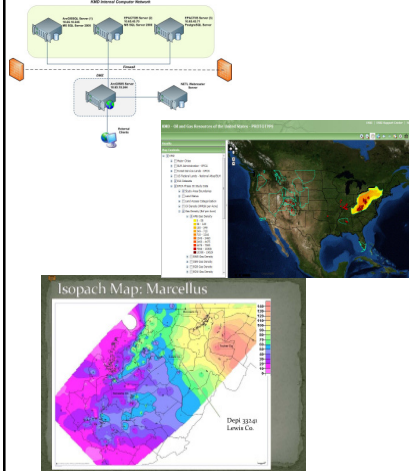
- **CO<sub>2</sub> Enhanced Oil Recovery**
  - Designed and synthesized fluorous and non-fluorous CO<sub>2</sub>-soluble surfactants that can form rodlike micelles, increasing CO<sub>2</sub> viscosity
  - Demonstrated that two commercially available nonionic surfactants can stabilize a CO<sub>2</sub>-in-brine emulsion at MMP
  - Developing core-flow experiment to assess viscosity performance in porous media
- **In-Situ Production of Oil Shale**
  - Initiated experiments to assess the dielectric and thermophysical properties of isolated kerogen; review of electromagnetic methods in oil shale production
  - Developing effort on science-based understanding of potential water issues for various in-situ production methods
- **Oil Production in Fractured Media**
  - Characterizing multiphase flow in Bakken shale cores
    - CT imaging of fractures; permeability/geomechanics under stress
    - Imaging of multiphase flow with CO<sub>2</sub> planned Q4 2009
  - Neural-network approach to predict location of highly productive wells
- **Catalog Experience/Knowledge from Oil-Shale and Tar-Sand Activities**
  - Archived historic oil-shale and tar-sand documents (18,000 reports) in a relational database management system

8

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## Resource Assessment

**Goal:** To enable better assessment of fossil resources by collection, management, and integration of high-resolution geospatial data



### Elements to Research Focus

- Knowledge management database development
  - Repository for R&D results related to the Section 999 R&D program
  - Searchable database that also includes historical oil/gas research from NETL
  - ArcGIS to enable data visualization
  - Beta version anticipated Aug/Sept 2009
- Marcellus shale database: high resolution data for improved assessment
  - Quantitative assessment of commercial gas in place via laboratory/well-logs correlations for improved models

10

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## Questions



11

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## **Attachment 8**



## URTAC Recommendations

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Gary L. Covatch  
Project Manager, Natural Gas & Oil Project Management Division



May 27, 2009

## URTAC 2009 Recommendation Areas

- Policy
- Near Term Impacts
- Research Focus
- Technology Transfer

## URTAC 2009 Policy Recommendations

- **Most Policy and Programmatic Issues to be addressed by HQ**
- **Implementation item: Goal of 30% Addition to Reserves**
  - NETL developing comprehensive Benefits Assessment Program with the goals:
    - Develop best available estimate of technically recoverable resource base impacted by technology
    - Develop sound, transparent methodology to determine the benefits at Project and Program levels
- **Implementation item: Mechanisms to balance environmental responsibility and resource development concerns.**
  - Program supports HQ efforts with Environmental Projects and Environmental Advisory Groups
  - Environmental Program to be discussed under Research Focus

## URTAC 2009 Recommendation Areas

- Policy
- **Near Term Impacts**
- Research Focus
- Technology Transfer



## URTAC 2009 Near Term Impacts Recommendations

- **Balance long term research, some short term projects with potential for early application**
  - To be addressed under Research Focus
- **Documentation of “early success” and making researchers knowledgeable of prior and on-going research**
  - To be addressed under Technology Transfer

## URTAC 2009 Recommendation Areas

- Policy
- Near Term Impacts
- **Research Focus**
- Technology Transfer

## URTAC 2009 Research Focus Recommendations

- **Expand the Program to include the following:**
  - Geosciences as applied to exploration, drilling, stimulation and re-stimulation
  - Basin analysis and real-time resource exploitation
  - Stimulation and Completion
  - Water Management
  - Environmental
  - Other Petroleum Resources

## Research Focus From RPSEA 2010 Draft Annual Plan

- **Focus to support three short and longer term high level goals:**
  - An integrated program of key technologies to enable specific unconventional gas resource development in a particular geographic area
  - Conduct early-stage novel concepts research for unconventional gas resource development
    - Example: biological enhancement of gas production
  - Development and execution of innovative approaches to integrate research results into commercially available services

## 2010 Integrated Solicitation Strategy

- Build on the existing portfolio of projects developed during the 2007-2009
- Ensure a coordinated program addressing the technology challenges of resource development in at least three specific unconventional gas resources
- Aim to fill program gaps remaining after the 2009 projects are chosen and build on the positive results of ongoing projects

10

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## Existing Integrated Unconventional Gas Program

	CBM	10%	Gas Shales 45%	Tight Sands 45%
Integrated Basin Analysis			New Albany (GTI) \$3.4	Piceance (CSM) \$2.9
Drilling				
Stimulation and Completion	Microwave CBM (Penn) \$0.8		Cutters (Carter) \$0.9 Frac (UT Austin) \$0.69 Refrac (UT Austin) \$0.95 Frac Cond (TEES) \$1.6	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$0.22
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Reservoir Engineering			Decision Model (TEES) \$0.31 Coupled Analysis (LBNL) \$2.9	Wamsutter (Tulsa) \$0.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$0.52
Resource Assessment			Alabama Shales (AL GS) \$0.5 Manning Shales (UT GS) \$0.43	Rockies Gas Comp. (CSM) \$0.67
Exploration Technologies	Coal & Bugs (CSM) \$0.86		Multi-Azimuth Seismic (BEG) \$1.1	

2007 Projects

2008 Projects

11

NATIONAL ENERGY TECHNOLOGY LABORATORY

## URTAC 2009 Research Focus Recommendations (NETL R&D)

- **Expand the Program to include the following:**
  - Environmental: NETL FOA: Closed June 5, 2009
    - Water resources & water management for shale gas development
    - Science to support regulatory streamlining and permitting associated with shale gas development
    - Alaskan water management solutions for issues arising from development of local oil and natural gas resources for use by remote communities.
  - Other Petroleum Resources (NETL In-house Research)
    - Enhanced and Unconventional Oil Recovery
      - Development of advanced technologies to move the status of known technically unrecoverable oil resources to technically and economically recoverable resources

## URTAC 2009 Recommendation Areas

- Policy
- Near Term Impacts
- Research Focus
- **Technology Transfer**

## URTAC 2009 Technology Transfer Recommendations

- The plan should specifically outline the steps necessary to communicate the results of the research and technologies developed.
- The program should utilize organizations and conferences to promote the knowledge management system and technology transfer process. Include mention of RPSEA forums, etc.
- The knowledge management system of the Unconventional Resources and Small Producer Program should be linked to other knowledge management resources.
- Once a knowledge management system has been developed, metrics are necessary to evaluate and communicate successes.

## URTAC 2009 Technology Transfer Recommendations

- *The plan should specifically outline the steps necessary to communicate the results of the research and technologies developed.*
  - NETL has developed and will implement a Technology Transfer plan that provides the internal process for integrating information from the following DOE Oil and Gas Programs for dissemination to a broad audience of stakeholders:
    - Methane Hydrates
    - Effective Environmental Protection
    - (Unconventional) Oil
    - EPA Act 2005, Title IX, Subtitle J, Section 999
    - Congressionally Directed Projects

## URTAC 2009 Technology Transfer Recommendations

*The program should utilize organizations and conferences to promote the knowledge management system and technology transfer process.*

- **NETL Technology Transfer Partners and Products:**
  - Partners:
    - PTTC
    - RPSEA
    - New Technology Transfer Agreement (Existing ends 8/30)
      - Solicitation closed May 15, 2009
  - Products:
    - E&P Focus Newsletter
    - RPSEA Workshops and Conferences
    - Active engagement of trade press for technology publications
    - Publications and workshops from the New Tech Transfer agent
    - NETL Website
      - **Knowledge Management Database/System**

## NETL Technology Transfer Program

	RPSEA	NETL	Contractors	DOE-HQ	
<b>Information to be Delivered</b>	<b>Project Reports</b>		Complementary program	Interim and final reports	
	<b>Project Data Sets</b>		Complementary program	Spreadsheets, GIS, other	
	<b>Project Software</b>			Models and online tools	
	<b>Presentations/papers</b>	Program and project level	Program and project level	Project level	High Level Program
	<b>Program Information</b>	RFPs, deliverables, metrics, feedback	Program updates, benefit assessments		Program activity, FAC reports, mandated info.
<b>Delivery Vehicle</b>	<b>Project websites</b>			Selected projects have websites	
	<b>Program websites</b>	RPSEA site with links	Portal on NETL site with links	Pages on DOE site	
	<b>Publications</b>	Newsletter, articles in trade press	Newsletter, Techlines, articles in trade press	Technical papers, articles	Press releases, Techlines
	<b>Forums/workshops</b>	RPSEA forums and workshops	PTTC workshops		
	<b>Public meetings</b>	SPE papers, other technical meetings	SPE papers, other technical meetings	SPE papers, other technical meetings	

# URTAC 2009 Technology Transfer Publications Currently Available



# Section 999 Tech Transfer Index

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Area	Project	Performer	Contract Number	Performer Address	PI	Project Cost	Federal Cost	Cost Share	Start Date	End Date	RP Cost	PI Cost				
1	Small Producer Field Site Testing of Low Impact Oil Field Access Roads: Reducing the Environmental Impact of Completions in Desert Regions	TEES	0122-01	471 Wilbur D Fox Plaza College Station, TX 77785		\$448,678	\$28,670	\$95,000	9/2006	9/2009	MI	CA				
2	Small Producer Wellhead and Completion Control	University of Missouri, Rolla	0122-02	Missouri University of Science and Technology, 600 S. University Center, Ste. 1000, So. Rolla, MO 65401-0100		\$76,776	\$50,200	\$26,576	8/9/08	7/31/09	PI	CA				
3	Small Producer New Mexico CO2 Injection to Improve Oil Recovery for Small Producers	University of Kansas	0122-03	Youngberg Hall 208 Ave. Hallstead Lawrence, KS 66044	Jim Byrd Texas	\$342,716	\$274,171	\$68,545	9/2006	9/2009	KEH	CA				
4	Small Producer Enhancing Oil Recovery from Mature Reservoirs through Improved Completion Control	University of Kansas	0122-04	Youngberg Hall 208 Ave. Hallstead Lawrence, KS 66044		\$55,441	\$24,336	\$31,105	9/2006	8/24/09	MI	CA				
5	Small Producer Cost Effective Treatment of Produced Water Using Co-Produced Energy Sources for Small Producers	New Mexico Tech (NETL)	0122-05	901 Leroy Place Socorro, NM 87601		\$1,944,891	\$497,200	\$1,447,691	9/2006	9/2009	KEH	CA				
6	Small Producer Remote Operations for Small Producers	University of Kentucky	0122-06	200 Catherine Road, MEX300033 Berkeley, CA 94720		\$1,177,373	\$723,373	\$454,000	9/9/08	9/9/09	MI	CA				
7	Small Producer Field Site Testing of New PVT Fluids in Small Producers	New Mexico Tech (NETL)	0122-07	901 Leroy Place Socorro, NM 87601		\$793,298	\$99,000	\$694,298	8/9/08	8/9/09	KEH	CA				
8	Unconventional Development of Unconventional Gas Development in Basins: Tight Fracture and Completions	Center Technology	0122-08	3702 Green River Drive Burlington, CO 80401	Emmet Carter	\$18,800	\$1,608	\$2,232	7/24/09	2/28/09	KEH	CA				
9	Unconventional Application of Novel Gas Completion Technology to Improve Completion to Maximize Large Tight Gas Basins	Colorado School of Mines	0122-09	1600 Bruce Street Golden, CO 80401	Harris	\$1,814,417	\$870,417	\$944,000	9/25/08	8/30/09	KEH	CA				
10	Unconventional An Integrated Framework for the Treatment and Management of Produced Water	Colorado School of Mines	0122-10	1600 Bruce Street Golden, CO 80401	Ed Brown	\$4,977,895	\$1,998,300	\$2,979,595	9/2008	3/31/09	KEH	CA				
11	Unconventional Completion Investigation of Fractured Reservoirs at Various Enhancing Mobility	Colorado School of Mines	0122-11	1600 Bruce Street Golden, CO 80401	Jack Marshall Main	\$1,246,790	\$84,320	\$1,162,470	9/2008	9/30/09	KEH	CA				
12	Unconventional Development of Unconventional Gas Development in Basins: Tight Fracture and Completions	Center Technology	0122-12	3702 Green River Drive Burlington, CO 80401	Chap	\$1,723,256	\$2,894,261	\$4,617,517	9/9/08	9/9/09	KEH	CA				

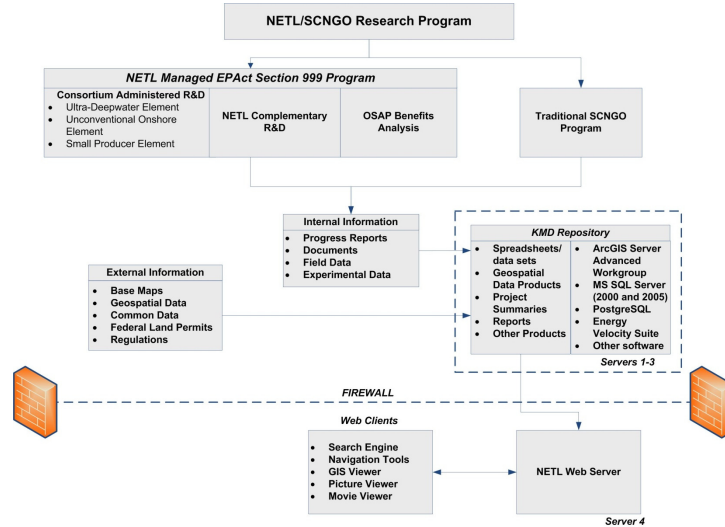
- 2 Primary Worksheets: Unc. Resources/Small Producers and UDW ... list all basic project information: Who, What, Where, When, How Much, as well as all tech transfer products/delivery dates

- Other work-sheets roll up tech transfer items by type, date and program area
- Each document is linked to its location on NETL, RPSEA, FE-HQ or PI website
- Additional worksheet provides future planned events - RPSEA forums, meetings, papers, presentations, etc.
- Spreadsheet will be updated regularly and can be easily e-mailed

## Technology Transfer: NETL KMD Deployment Timeline

ID	Task Name	Jun 2009		Jul 2009			Aug 2009				Sep 2009			Oct 2009										
		5/31	6/7	6/14	6/21	6/28	7/5	7/12	7/19	7/26	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27	10/4	10/11	10/18	10/25	
1	Prototype KMD Online at NETL INTERNET																							
2	Fully Searchable Document Repository (50GB) ONLINE																							
3	Interactive Dashboards ONLINE																							
4	Interactive GIS (Map) Applications ONLINE																							

## Technology Transfer: NETL KMD Organization of Information Flow





## KMD Planned Key Products/Capabilities

- **CD/DVD Library online containing previous oil and gas research at NETL**
  - Compiles historical research
  - Converts the NETL publications page to a dynamic library for retrieving documents
  - Maintains the CD/DVD tree structure for searching
  - Contains 45 CDs and DVDs with 9,000+ PDFs, 186 Word DOCs, 61 spreadsheets, and 217 databases
- **Document Database to allow searching of historical oil and gas research that will contain**
  - DOE/NETL Project technical/topical reports
  - Key publications from the CD/DVD library
  - Key publications from the OSTI database
  - Reference for copyright-protected documents and documents that are not available in electronic format
  - Additional documents from the NETL Morgantown library: 397 final reports in PDF format and references to 5,000+ additional hard-copy reports

## KMD Planned Key Products/Capabilities

- **Xcelsius Models to provide a dashboard visualization of detailed oil and gas, and environmental data**
  - **Outer Continental Shelf (OCS) Model**
    - Details information for the OCS Regions and Planning Areas
    - Provides undiscovered technically recoverable resources (UTRR) for gas and oil
    - Allows user control to select region or planning area display of resources
    - Indicates resources by water depth
  - **Allegheny National Forest Model**
    - Display environmental data related to drilling in the Allegheny National Forest including well density and watershed boundaries
    - Future enhancements may include relationship of data to the Marcellus Shale, along with trends of data for roads and chemical analysis within the National Forest

# KMD Planned Key Products/Capabilities

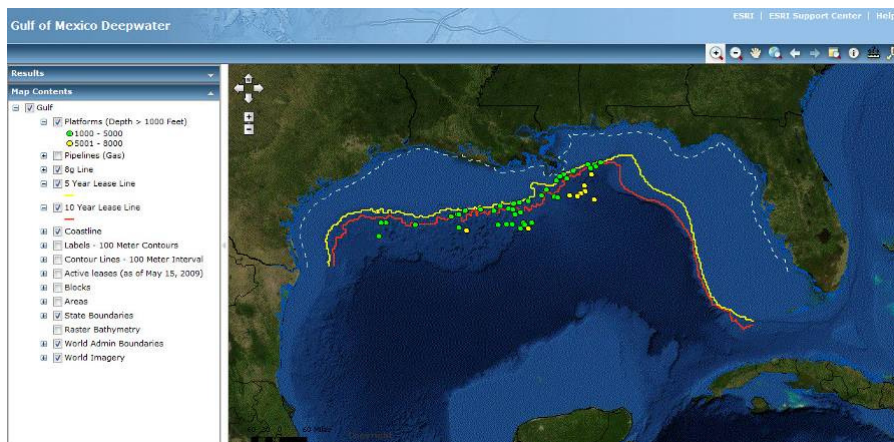
## ArcGIS Web Map Services

allows visualization of data related to oil and gas research

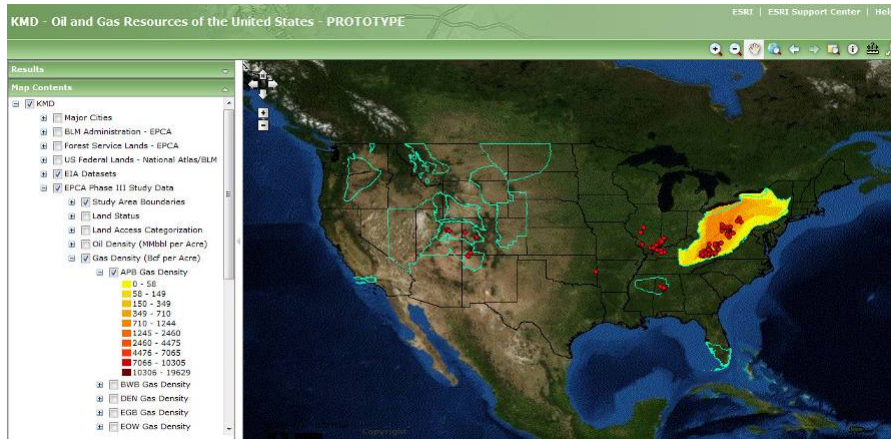
- Gulf of Mexico (GOM) Deepwater
  - Data from the Minerals Management Service related to leases (i.e. 5- and 10-year lease lines, active leases, 8g line, coastline, state boundaries, and leases by water depth greater than 1,000 ft)
  - Infrastructure including platforms in water depth greater than 1,000 ft and gas pipelines
  - Location (area and block) and detailed bathymetry data for the GOM
- KMD – Oil and Gas Resources of the United States
  - Data from the Energy Policy and Conservation Act (EPCA) Phase III assessment for onshore oil and gas resources and restrictions/impediments to their development
    - Study area boundaries, land status, and land access categorization
    - Total oil density and total gas density per study area
    - Boundary data including Federal Lands, county/state boundaries, lakes/ivers, highways, railroads, and major cities
  - Data from the Energy Information Administration
    - Boundary data for U.S. oil and gas field maps
    - Coalbed methane cumulative production, reserves and resources, and gassy coal mines
    - Shale gas basins and plays

# KMD Planned Key Products/Capabilities

## *Gulf of Mexico Deepwater ArcGIS Prototype*



## KMD Planned Key Products/Capabilities Onshore Oil and Gas Resources of the U.S. Prototype

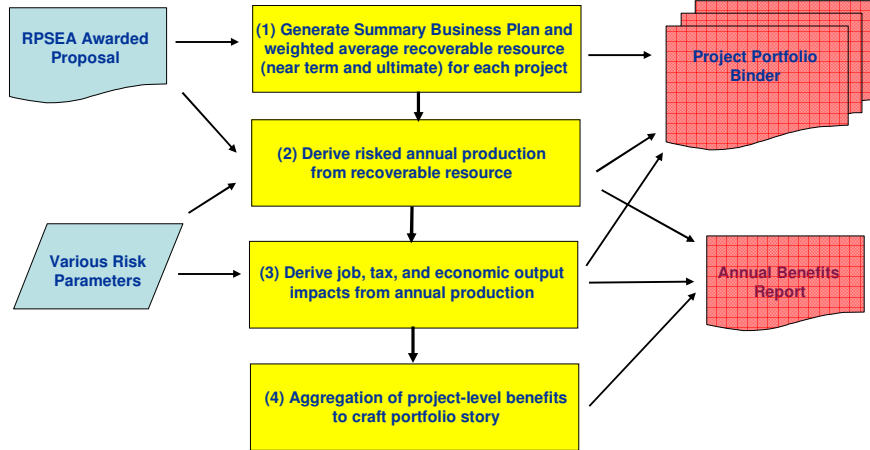


## URTAC 2009 Technology Transfer Recommendations

*Once a knowledge management system has been developed, metrics are necessary to evaluate and communicate successes.*

- NETL is currently developing peer reviewed models for development of benefits from the Program

## EPAct 999 Benefits Process Methodology for RPSEA UNG&SP Projects



## Questions

