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.

[Signature]
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 3rd**: Deliver the draft *2010 Annual Plan* to the members
- **Sept 15-16, 2009, 10th URTAC meeting in San Antonio, TX**
- **October 15, 2009, 11th URTAC meeting in Los Angeles, CA**
- **October 22, 2009, 12th 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 31st, in order to facilitate their development of a preliminary strategy for review of the *2010 Annual Plan* during the 10th URTAC meeting.

The meeting was adjourned at 4:30 PM.
## Attachments

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<td>Mr. Chris Hall</td>
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<td>Mr. Gary Covatch</td>
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<td>6</td>
<td>Mr. Bob Siegfried</td>
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<td>7</td>
<td>Mr. George Guthrie</td>
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<td>8</td>
<td>Mr. Gary Covatch</td>
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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
9th 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

1:00   Call to Order - Welcome

Member Roll Call and the presence of a quorum

Members, Chair, Designated Federal Officer, and Committee Manager
Chris Hall, Committee Chair

Meeting purpose and review of the agenda;
Insights regarding future funding and other pending legislation; Draft 2010 Annual Plan delivery, and pending meetings in September and October 2009

Guido DeHoratiis
Designated Federal Officer

1:25   Report from the Standing Subcommittee and Member Q/A and Discussion

Chris Hall
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
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: 7/14/09
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.
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.
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.

- 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.

- Too many of the projects did not mention the Technology Transfer component of their research unless it was specifically asked about.

4. RECOMMENDATIONS:
   - Greater effort needs to be made to ensure that project and technology transfer efforts will meet the objective of maximum national exposure.
   - Need more peer review of the presentations with critical questions. Often the questions were just informational; need a thesis type critical analysis by participants.
   - 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.
   - 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.
   - 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.
   - 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.
   - 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.
   - 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.
   - 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.
Status Update: EPAct 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

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

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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• 2010 Annual Plan Timeline

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 1st R&D subcontract July 28, 2008
• Last subcontract awarded April 29, 2009*

* Award delayed as PI changed Universities
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 1st 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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  - Risk Mitigation / Management
  - Communication Meetings
- 2010 Annual Plan Timeline
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

Questions
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

Secure Energy for America
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

- Resource Assessment
- Drilling
- Exploration Technologies
- Stimulation & Completion
- Reservoir Description & Engineering
- Environmental & Water Management

Integrating Basin Analysis
Technology Dissemination
Impact By Geologic Basin and Unconventional Resource

Secure Energy for America

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RPSEA Unconventional Gas Projects

Secure Energy for America $32 Million Research Portfolio

Integrated Basin Project

Technical/Resource Projects

Cross Cutting Technical Projects
- UH – Fracturing (UT)
- LBNL – Self Teaching Expert System
- UT – Refracturing
- TEES – Fracturing Gels
- LBNL – High Resolution Imaging
- PSU – Microwave Coals
- Carter – Saws
- Tulsa – Novel Fracturing Fluids
- Stanford – Condensate

CSM – Coal Bugs
Utah – Paleo Shales
Tulsa – Wamsutter
CSM – Gas Quality
U of Utah – TGS
CSM – Produced Wtr.
CSM – Piceance TGS
CSM – Strat Control

GTI – Barnett and Appalachia Produced Water

Cross Cutting Technical Projects
- HARC – Environmentally Friendly Drilling
- LBNL – Coupled Reservoir Model
- TEES – Fracture Conductivity
- BEG – Multi – Azimuth Seismic
- CalTech – Gas Isotopes

2008 Program Priorities
- H: High Priority
- M: Medium Priority
- L: Low Priority

2007 Projects

2008 Projects

$32.3 Million Research Portfolio
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

Project Highlights
Unconventional Onshore Program
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

<table>
<thead>
<tr>
<th>Technical Tasks</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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<td>Q4</td>
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<td>Task 1.0: Project Management Plan</td>
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<td>Task 2.0: Technology Status Assessment</td>
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<td>Task 3.0: Technology Transfer</td>
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<td>Task 5.0: Core and Cuttings Examination and Sample Analysis</td>
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<td>Task 6.0: Outcrop Examination and Sample Analyses</td>
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<td>Phase II</td>
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<td>Task 7.0: Determination of Best Completion Practices</td>
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<td>Task 8.0: Regional Correlation, Mapping, and Depositional History Determination</td>
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<td>•</td>
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<tr>
<td>Task 9.0: Final Interpretations and Recommendations</td>
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<td>•</td>
</tr>
</tbody>
</table>

### 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

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

Secure Energy for America
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.

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

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

- 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 CO₂ Application to Improved Oil Recovery for Small Producers
- Preformed Particle Gel for Conformance Control
- Seismic Stimulation to Enhance Oil Recovery

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

**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
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.

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

<table>
<thead>
<tr>
<th>Composition</th>
<th>Feed water</th>
<th>Purified water</th>
<th>Removal efficiency, %</th>
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</thead>
<tbody>
<tr>
<td>Total dissolved solid (TDS), mg/L</td>
<td>19756.0</td>
<td>76.35</td>
<td>99.6</td>
</tr>
<tr>
<td>Total suspended particulates, mg/L (0.22μm &lt; dia. &lt; 100μm)</td>
<td>99.6</td>
<td>Undetectable</td>
<td>100%</td>
</tr>
<tr>
<td>Total organic carbon (TOC), mg/L</td>
<td>470.2</td>
<td>17.83</td>
<td>96.2%</td>
</tr>
</tbody>
</table>

### Site Preparation and Demonstration Preparation

**Planned Site for Water Treatment**

- **Heat exchanger**
- **Water Pump**
- **Water tank**
- **Pump**
- **Solar panel**
## 2008 Small Producer Project Selections
### Reservoir Characterization

<table>
<thead>
<tr>
<th>Lead Organization</th>
<th>Title</th>
<th>Partners</th>
<th>Main region</th>
<th>Total Cost</th>
<th>Cost Share</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Texas of the Permian Basin</td>
<td>Commercial Exploitation and the Origin of Residual Oil Zones: Developing a Case History in the Permian Basin of New Mexico and West Texas</td>
<td>Chevron, Legado Resources, Yates Petroleum</td>
<td>Permian Basin</td>
<td>$962,251</td>
<td>34</td>
<td>2 years</td>
</tr>
<tr>
<td>Western Michigan University</td>
<td>Evaluation and Modeling of Stratigraphic Control on the Distribution of Hydrothermal Dolomite Reservoir away from Major Fault Planes</td>
<td>Polaris Energy Company</td>
<td>Michigan</td>
<td>$1,138,864</td>
<td>65</td>
<td>2 years</td>
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<tr>
<td>UT Austin - Bureau of Economic Geology</td>
<td>Development Strategies for Maximizing East Texas Oil Field Production</td>
<td>Danmark Energy, John Linder Operating</td>
<td>Texas</td>
<td>$1,969,890</td>
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## 2008 Small Producer Project Selections
### Oil and Gas Recovery

<table>
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<tr>
<th>Lead Organization</th>
<th>Title</th>
<th>Partners</th>
<th>Main region</th>
<th>Total Cost</th>
<th>Cost Share</th>
<th>Duration</th>
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<tbody>
<tr>
<td>New Mexico Institute of Mining and Technology</td>
<td>Mini-Waterflood: A New Cost Effective Approach to Extend the Economic Life of Small, Mature Oil Reservoirs</td>
<td>Armstrong Energy</td>
<td>Southwest</td>
<td>$1,107,669</td>
<td>71</td>
<td>2 years</td>
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<tr>
<td>Layline Petroleum 1, LLC</td>
<td>Field Demonstration Of Alkaline Surfactant Polymer Floods In Mature Oil Reservoirs Brookshire Dome, Texas</td>
<td>Tiorco, University of Texas at Austin</td>
<td>Mid-Continent</td>
<td>$1,226,396</td>
<td>51</td>
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</table>
## 2008 Small Producer Project Selections

**Utilizing Waste to Increase Efficiency**

<table>
<thead>
<tr>
<th>Lead Organization</th>
<th>Title</th>
<th>Partners</th>
<th>Main region</th>
<th>Total Cost</th>
<th>Cost Share</th>
<th>Duration</th>
</tr>
</thead>
</table>
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**
  - CO₂ enhanced oil recovery: control of CO₂ viscosity
  - in-situ oil shale production: tunable microwaves with CO₂; 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

Drilling under Extreme Conditions

Status

- 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 H₂S-environments identified via industry
  - Ambient-pressure fatigue testing initiated for corrosion fatigue (H₂S)
  - Completed design of HPHT fatigue test unit; procurement/installation initiated
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

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
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

- CO₂-enhanced oil recovery: Improved flow control by increasing CO₂ viscosity (tailored surfactants)
- In-situ production of oil shale: Improved heating of kerogen by tuned microwave and CO₂; 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

Unconventional Oil & Enhanced Oil Recovery

Status

- CO₂ Enhanced Oil Recovery
  - Designed and synthesized fluorous and non-fluorous CO₂-soluble surfactants that can form rodlike micelles, increasing CO₂ viscosity
  - Demonstrated that two commercially available nonionic surfactants can stabilize a CO₂-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 CO₂ 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
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

Questions
Attachment 8
URTAC Recommendations

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

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 ongoing 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

Existing Integrated Unconventional Gas Program

<table>
<thead>
<tr>
<th>Category</th>
<th>CBM 10%</th>
<th>Gas Shales 45%</th>
<th>Tight Sands 45%</th>
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<td>Drilling</td>
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<td>Stimulation and Completion</td>
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<td>Water Management</td>
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<td>Reservoir Description &amp; Management</td>
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<td>Exploration Technologies</td>
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2007 Projects
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
  • EPAct 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

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<tr>
<th>Information to be Delivered</th>
<th>RPSEA</th>
<th>NETL</th>
<th>Contractors</th>
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<tr>
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<td>Complementary program</td>
<td>Interim and final reports</td>
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<tr>
<td>Project Data Sets</td>
<td>Complementary program</td>
<td>Spreadsheets, GIS, other</td>
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<tr>
<td>Project Software</td>
<td>Models and online tools</td>
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<td>Presentations/papers</td>
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<td>Project level</td>
<td>High Level Program</td>
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<td>Program Information</td>
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<td>Program updates, benefit assessments</td>
<td>Program activity, FAC reports, mandated info.</td>
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<th>Delivery Vehicle</th>
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<td>Pages on DOE site</td>
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<tr>
<td>Publications</td>
<td>Newsletter, articles in trade press</td>
<td>Newsletter, Techlines, articles in trade press</td>
<td>Technical papers, articles</td>
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<tr>
<td>Forums/workshops</td>
<td>RPSEA forums and workshops</td>
<td>PTTC workshops</td>
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<tr>
<td>Public meetings</td>
<td>SPE papers, other technical meetings</td>
<td>SPE papers, other technical meetings</td>
<td>SPE papers, other technical meetings</td>
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</tbody>
</table>
URTAC 2009 Technology Transfer
Publications Currently Available

Section 999 Tech Transfer Index

- 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
**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

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**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**
    - Displays 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/rivers, 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

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**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*

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**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

1. Generate Summary Business Plan and weighted average recoverable resource (near term and ultimate) for each project
2. Derive risked annual production from recoverable resource
3. Derive job, tax, and economic output impacts from annual production
4. Aggregation of project-level benefits to craft portfolio story

Questions