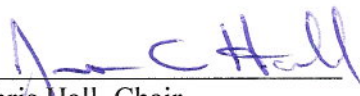


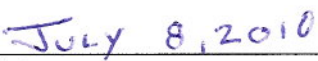
**Unconventional Resources Technology Advisory Committee
(URTAC)
September 15-16, 2009
Tenth Meeting**

Meeting Minutes

Unconventional Resources Technology Advisory Committee

I hereby certify that this transcript constitutes an accurate record of the Unconventional Resources Technology Advisory Committee meeting held on September 15-16, 2009.


Chris Hall, Chair
Unconventional Resources Technology
Advisory Committee


Date

**Minutes of the 10th Meeting of the
Unconventional Resources Technology Advisory Committee
(San Antonio, TX, September 15-16, 2009)**

Call to Order

The meeting was called to order at 1:00 PM on September 15th by Mr. Chris Hall, Chair¹. The Chair described the reason for the meeting which is to begin review of the DOE *Draft 2010 Annual Plan*, the work ahead, and the upcoming meeting in Los Angeles and via teleconference in October. He turned the meeting over to the Committee Manager.

Committee Business: Change of Membership

Elena Melchert, the DOE Committee Manager (CM), informed the group that the Secretary had accepted the resignations of Dr. Jeff Cline who had resigned due to health reasons, and the resignation of Ms. Juliette Faulkner who resigned as a result of a change to Federal employment².

The CM reported that 10 of 16 Unconventional Resources Technology Advisory Committee (URTAC) members were present (Attachment 2). She further reported to Mr. Guido DeHoratiis, DOE Designated Federal Officer (DFO) that a quorum was present.

Opening Remarks

The DFO thanked everyone for attending. He reminded the members that the due date for written comments and recommendations was October 23, 2009, and that the next meeting of the UDAC would take place on October 15, 2009 in Los Angeles, CA.

The Chair then addressed a change to the schedule regarding the organization of the Review Subcommittees and topics for review. Mr. Hall described a spreadsheet³ he had developed based on comments from the Standing Subcommittee members that was intended to speed up the review process.

Presentations and Discussion

Overview of DOE Draft 2010 Annual Plan

Mr. Mike Ming, RPSEA⁴, provided an overview of the entire RPSEA *2010 Draft Annual Plan* (Attachment 4). He highlighted the high degree of participation in the program by the private sector. He noted that the RPSEA *2010 Draft Annual Plan* had been built on the foundation provided by the prior three annual plans.⁵ He reported no significant course corrections from prior year plans. From 2007 to 2008 there was a 40% increase in the number of proposals received for the Unconventional Resources program (UCR). He indicated that the solicitations for proposals to be funded by the Fiscal Year 2009

¹ The approved agenda is included here as Attachment 1.

² EPCA, Title IX, Subtitle J, Section 999D(b)(2)(E) states that no individuals who are Federal employees may serve as members of the Unconventional Resources Technology Advisory Committee.

³ Spreadsheet is included as Attachment 3.

⁴ Research Partnership to Secure Energy for America (RPSEA)

⁵ *2007 Annual Plan, 2008 Annual Plan, 2009 Annual Plan*

funds were imminent. Mr. Ming summarized the number of selections for the 2007 and 2008 portfolios for all three elements of the cost-shared program⁶.

Mr. Ming described that the structure of the RPSEA advisory committees for unconventional resources and small producers involves 100s of volunteers. RPSEA has held more than 25 meetings related to the UCR. This totals a considerable number of volunteer hours.

The Chair requested a graphical display of projects against a timeline. The CM responded that such a document would be produced as an action item for delivery at the next meeting.

The Chair asked about the geographical distribution of the UCR and SP⁷ across all oil and gas producing regions of the country wondering about the frequency with which RPSEA assesses this aspect of the program stating that California is one region that is under-represented in terms of the number of RPSEA member forums held. Mr. Ming agreed to look into this question.

Mr. Bob Siegfried, RPSEA, then gave a detailed presentation (Attachment 5) on the Unconventional and Small Producer project portfolios.

The Chair commented on the RPSEA project review that he and three Standing Subcommittee members had attended in April 2009⁸ had been an excellent opportunity for the Standing Subcommittee to learn more about the projects, and that it was also an excellent technology transfer event in and of itself; the various researchers were learning from each other. He suggested that this event could be a symposium open to the public where projects are also presented as posters.

The CM agreed that the project review meeting was a good event, and that there might be a way for that information to be disseminated publically. Mr. Siegfried agreed.

He then described the projects selected for the 2008 portfolio and topics for solicitation of proposals for Fiscal Year 2009 funding. He also described how some previous URTAC recommendations had been addressed.

⁶ There are four research components in the *Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program* of which RPSEA administers three: Ultra-Deepwater, Unconventional Natural Gas and Other Petroleum Resources, and Small Producers. These three components require that the costs of the research be shared with the Federal Government by the research partners. The fourth component is the NETL Complementary Research Program conducted at the National Energy Technology Laboratory (NETL)

⁷ Small Producers research program (SP)

⁸ RPSEA Unconventional Gas Project Review Meeting, Tuesday 14-Apr-09 8:00 AM to Wednesday 15-Apr-09 5:00 PM MDT

Overview of Technology Transfer

The Chair then recognized Mr. Roy Long, NETL, who presented the status of technology transfer efforts (Attachment 6). This included a WebEx demo of the Knowledge Management Database (KMD) conducted online in real time by staff in Morgantown, WV via the Internet. The Chair encouraged DOE to hold workshops on the KMD in association with PTTC⁹ in various regions.

Overview of RPSEA's Environmental Advisory Group

Dr. Rich Haut, HARC¹⁰, discussed the work of the RPSEA Environmental Advisory Group (EAG) (Attachment 7).

Discussion then focused on the state and national trade associations and producer group strategies that have been developed for addressing some of the environmental regulatory issues that the EAG is reviewing.

A question was raised as to how the EAG interacts with these groups in order to make certain that they are welcoming to particular technology solutions. It was noted that many trade associations have approached these issues in an adversarial manner, that the situation is complex, and that there should be multiple strategies. Dr. Haut described the meetings with the various groups, both past and planned.

Review Subcommittees

The Chair displayed a spreadsheet¹¹ of comments received from members of the committee related to the *DOE Draft 2010 Annual Plan*¹². He explained how these comments had been categorized using prior Review Subcommittee topics. These topics will be the starting point for recommendations developed by the URTAC for the Secretary on the *DOE Draft 2010 Annual Plan*.

The Chair described the structure of the review process that would be followed for the remainder of the meeting in support of the Review Subcommittees as they draft their recommendations.

Each member who had provided comments was given the chance to elaborate on their input (Don Sparks, Sandra Marks, Jessica Cavens, James Dwyer, Janet Weiss, Nick Tew, Chris Hall). These comments included:

- There is a need for research oil from fractured shales.
- Also a huge “hole” related to drilling projects (e.g., coiled tubing drilling).

⁹ Petroleum Technology Transfer Council

¹⁰ Houston Advanced Research Center (HARC)

¹¹ See Attachment 3

¹² The *DOE Draft 2010 Annual Plan* was made available to the URTAC and the public via the URTAC website beginning August 2009.

- Also: pumping horizontal wells and innovative artificial lift technologies.
- There was some discussion about current traditional program projects related to Bakken shale.
- Need to do more field tests and demo projects as opposed to basic research. Need balance here. More projects that can be “kicked over the edge.”
- NETL has done a “fantastic job” with KMD; we need to acknowledge that.
- Lack of environmental projects.
- In policy statements, need to advocate for natural gas a clean, low-carbon fuel.
- We need to acknowledge the fact that DOE has responded well to committee recommendations, particularly as regards technology transfer efforts.
- Need to address problem of geographic imbalance of projects.
- Need additional emphasis on communicating with producers through regional trade associations.

Additional Committee Discussion

The Committee asked for the actual average percentage cost-share for projects, and Mr. Ming answered that it is about 50 percent for the SP, about 21 percent for UDW¹³ and about 30-35 percent for UCR. Mr. Bob Hardage commented that the Bureau of Economic Geology only commits to the minimum 20 percent cost-share when presenting a proposal with required cost-share while they often contribute much, much more in actuality.

The meeting was suspended until the following day.

NETL Complementary Research Program

Dr. George Guthrie, NETL, presented a detailed discussion on NETL Complementary Research Program (Attachment 8). Information was requested on the nature of the various relationships among the different research groups within DOE, and their areas of focus. There was some discussion about the subsurface drip irrigation research and the degree to which DOE was interfacing with USDA¹⁴ on this topic.

Update on the Benefits Assessment Project for UCR and SP

Mr. Phil Dipietro, NETL, provided an overview of objectives, the methodology being developed, results of the formal peer review meeting, preliminary estimates of benefits for the 2007 portfolio, and a description of the plans for future activity related to benefits assessment (Attachment 9).

A member asked about history matching the results asking if NETL had tried to test or fine tune the methodology using NETL’s prior history of successful research projects.

¹³ Ultra-Deepwater research (UDW) one of the four research elements of the *Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program*

¹⁴ US Department of Agriculture (USDA)

He also suggested the notion of applying fuzzy logic to the problem for use in situations where the uncertainties associated with vagueness could be characterized with this technique.

A committee member asked if the “2-page” summaries¹⁵ are available for review by URTAC members. The answer was that all of the information would be made publicly available upon completion of the project. The Chair requested that in the future the 2-pagers be supplied to the Committee along with the annual plan, recognizing that the purpose of review by the URTAC members would be for improved understanding of the portfolio, not for judging the merit of individual projects.

A member suggested that DOE write a peer-reviewed paper on the methodology as a way to invite wider review of the technique.

Update on Royalties Report and Technical Committee Report

Ms. Elena Melchert, DOE, provided an update on several items (Attachment 10): the status of the Royalties Report to Congress, and status and conclusions of the Technical Committee Report¹⁶.

The CM asked the Committee to consider for the future the possibility of having WebEx meetings devoted to single topics (e.g., benefits assessment) in order to accommodate more detailed discussion on specific topics, and the Committee agreed.

The CM then explained the driver behind the Technical Committee and stated that the Technical Committee had met on August 6, 2009 and determined that there was no duplication between the NETL Complementary Research Program and the cost-shared program administered by the Program Consortium, RPSEA. Through this discussion the Technical Committee report became part of public record (Attachment 11).

The Chair requested a diagram that details all of the various requirements of Section 999 be appended to the record of the meeting. This is included as Attachment 12.

Budget and Legislative Update

Mr. Guido DeHoratiis, DOE, then provided a legislative update related to Section 999. He very briefly described the legislative process, and explained that the House of Representatives (House) version of the Fiscal Year 2010 Budget was silent on the Administration’s request to repeal Subtitle IX, Sections 999A – 999H of the Energy Policy Act of 2005. He recounted that Senate Energy Bill 1462 contained language to take a portion of the funds assigned to the UDW and the NETL Complementary Research

¹⁵ Each project in the portfolio is characterized along a series of parameters that are summarized in a 2-page document.

¹⁶ EPA Act Title IX, Subtitle J, Section 999H(d)(4) requires the DOE to establish and operate a Technical Committee “...to ensure that in-house research activities [the NETL Complementary Research Program is] technically complementary to, and not duplicative of, research [administered by the Program Consortium].”

Program to fund a seismic inventory of offshore resources. He also discussed that the House language for the Interior Department Appropriations Bill would defer Section 999 funds for 2010 while sharing that the Senate version was silent on this matter. He also described a Defense Authorization Bill that calls for the use the funds identified for Fiscal Year 2011 activities to fund a retirement program for disabled military veterans.

There were questions about DOE's position on the different bills focusing on oil and gas taxes. Mr. DeHoratiis restated the Administration's position, and that the Office of Fossil Energy had been involved in analyzing some of the impact of these provisions¹⁷. A member commented that if some form of the pending legislation supported by the Administration were to pass, there would be no reason to fund research into unconventional resources as development of these resources would be drastically reduced. The Chair stated that the Committee's role was still to point out the value of the program and advise the Secretary of Energy.

NETL Status Update

Roy Long provided an overview of NETL's oversight activities since the last meeting (Attachment 13). He talked about the PTTC contract recently awarded by NETL, and the various technology transfer activities under way (e.g., newsletters, SPE¹⁸ meeting plans). He discussed that the implementation of the KMD¹⁹ and its planned rolled out at the 2009 Annual Meeting of the SPE in New Orleans. Mr. Long also provided some detail on the portfolio analysis being carried out on the NETL Complementary Research Program and how the review by the Technical Committee had been carried out.

A member suggested that the KMD be presented at the IPAA²⁰ meeting on November 4, 2009. The Chair commented that NETL's effort to get PTTC involved in implementing technology transfer, with specific tasks related to workshops, was a good decision.

Calendar and Next Steps

The CM reviewed the Committee calendar and next steps (Attachment 14). She reiterated action items for the next meeting (October 15 in Los Angeles). These included: present KMD to the IPAA at their next meeting, prepare a chart of the various oil and gas R&D programs within DOE, an organization chart that illustrates the relationship among the various requirements within Subtitle J, and a timeline showing the progress of individual projects.

The CM also outlined the next steps: formation of ad-hoc Review Subcommittees today and their work during September and early October, the meeting on October 15 to finalize the report content, the Editing Subcommittee and their charge, and the subsequent October 22 teleconference for final approval of the Editing Subcommittee

¹⁷ There were about 8 different taxes discussed, of which the intangible drilling cost exemption and percentage depletion are of the greatest importance to producers

¹⁸ Society of Petroleum Engineers (SPE)

¹⁹ Knowledge Management Database (KMD)

²⁰ Independent Petroleum Association of America (IPAA)

report. She informed the members that their appointments would expire during August 2010, and that recruitment efforts for new Committee member would begin in January 2010, and that they would be asked to reapply for membership if they were interested in reappointment to the Committee.

Committee Discussion – Formation of Subcommittees

The Chair presided over a discussion regarding the topics to be assessed by the Review Subcommittees and Subcommittee membership and chairmanship (Attachment 15).

The CM restated the URTAC's deliverable to the Secretary of Energy, and suggested that each ad-hoc Review Subcommittee should consider preparing findings and recommendations as input to the URTAC's written report to the Secretary.

The Chair provided some direction on how the comments would be submitted. There was some discussion about the possibility of using GoogleDocs as a vehicle for compiling comments²¹.

The Committee engaged in further discussion regarding the timing of the work to be conducted prior to the next meeting, and the format of findings fitting a template for the report. The CM reminded the Committee that all that their work and discussions are to be held in a public forum.

The Chair reminded everyone that the Committee Chair's role is to facilitate the collection and packaging of information, not to drive his/her opinion into the Committee's findings and recommendations. He reinforced that every member has the right to express their opinion as a minority opinion in the Committee's final report, if they do not agree with the majority position. He reminded that while the goal is to reach consensus, it is not a requirement of the way the Committee conducts its business.

Having completed the items on the agenda, the meeting was adjourned.

²¹ The notion of using this private space as a way for the Committee to prepare its findings and recommendations was discussed by the CM with the DOE Office of General Counsel. It was determined that such a process was inconsistent with the spirit of the Federal Advisory Committee Act. The ad hoc Review Subcommittees met individually and prepared their comments for presentation to the full Committee at its next meeting.

Attachments

	Presenter	Topic
1	For the Record	Meeting Agenda
2	For the Record	Committee Members and Meeting Participant Attendance
3	Mr. Chris Hall	Organization of the Review Subcommittees and Topics for Review
4	Mr. Mike Ming	Overview of the RPSEA <i>2010 Draft Annual Plan</i>
5	Mr. Bob Siegfried	Unconventional and Small Producer Project Portfolio Overviews
6	Mr. Roy Long	NETL Technology Transfer : KMD Demonstration
7	Dr. Rich Haut	Environmental Advisory Group (EAG) Current Activities
8	Mr. George Guthrie	NETL Complementary Research Program Status
9	Mr. Phil Dipietro	RPSEA 2007 Unconventional and Small Producer R&D Portfolio Benefits Analysis
10	Ms. Elena Melchert	Status Updates of the Royalties Report to Congress
11	For the Record	Technical Committee Report
12	For the Record	Diagram of Section 999 Requirements
13	Mr. Roy Long	Closeout: Program Overview
14	Ms. Elena Melchert	UDAC Calendar and Next Steps
15	For the Record	Review Subcommittees

Attachment 1

Unconventional Resources Technology Advisory Committee
September 15-16, 2009
Crowne Plaza Riverwalk, 111 E. Pecan Street, San Antonio, TX

September 15, 2009

1:00 PM
Central Daylight Time

Public Registration

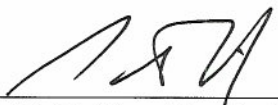
12:30	<i>Members assemble</i>	
1:00	<i>Ethics Briefing [Members only]</i> <i>Via WebEx and Conference Call</i>	<i>Krys Urchick, DOE</i> <i>Office of General Counsel</i>
1:30	Call to Order/ Welcome / Introductions	Chris Hall, Chair
1:40	Committee Business: Membership changes and new quorum	Elena Melchert, DOE Committee Manager
1:45	Committee Instructions: Deadline for receipt of Committee Recommendations [EPA Act Sec. 999B(e)(2)(B)]	Guido DeHoratiis, DOE Designated Federal Officer
1:50	Overview of the <i>Draft 2010 Annual Plan</i> : - --Unconventional Resources Program --Small Producers Program	Robert W. Siegfried, RPSEA Vice President Unconventional Onshore
2:50	Committee Discussion	Chris Hall
3:20	BREAK	
3:30	Technology Transfer: Demonstration of the Knowledge Management Database	Roy Long, NETL Strategic Center for Natural Gas and Oil
4:00	Committee Discussion and Q/A	Chris Hall
4:10	Overview of RPSEA's Environmental Advisory Group	Rich Haut, Chair RPSEA Environmental Advisory Group
4:30	Committee Discussion and Q/A	Chris Hall
4:40	Committee discussion and planning for the review of the <i>2010 Annual Plan</i> --Establish Review Subcommittees --Establish the Editing Subcommittee	Chris Hall /Facilitator
5:00	Suspend proceedings until next day 8 am	Chris Hall

Unconventional Resources Technology Advisory Committee
September 15-16, 2009
Crowne Plaza Riverwalk, 111 E. Pecan Street, San Antonio, TX

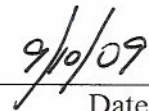
September 16, 2009

7AM	Member Breakfast / Open Registration	
8:00	Call to Order	Chris Hall
8:10	NETL Complementary Research Program Highlights: --Drilling under Extreme Conditions * UDS * nanofluids --Unconventional Oil and Enhanced Oil Recovery * CO2 viscosity * CO2-water-hydrocarbon EOS --Environmental Impacts of Oil/Gas Operations * Subsurface drip irrigation	George Guthrie, NETL Office of Research and Development
8:40	Benefits Assessment Project Overview: --Unconventional Resources Program --Small Producers Program	Phil Dipietro, NETL Office of Systems Planning and Analysis
9:10	Section 999 Program: --Royalties Report to Congress --Technical Committee Report	Elena Melchert, DOE Program Manager Office of Oil and Natural Gas
9:20	Committee Discussion and Q/A	Chris Hall
9:30	BREAK	
9:45	Budget and Legislative Updates Committee Discussion	Guido DeHoratiis, DOE Acting Deputy Assistant Secretary Office of Oil and Natural Gas
10:00	Standing Subcommittee Report	Chris Hall, Subcommittee Chair
10:20	NETL Close Out: --Status update as of last meeting	Roy Long, NETL Strategic Center for Natural Gas and Oil
10:40	Committee Calendar and Next Steps	Elena Melchert, Committee Manager
11:00	Committee Discussion and Q/A	Chris Hall
12:00 p	Adjourn	Chris Hall

APPROVED:



Guido DeHoratiis, Designated Federal Officer



Date

Attachment 2

**Unconventional Resources Technology Advisory Committee Meeting
Sign-In Sheet - September 15-16, 2009**

Last Name	First Name	Organization	Sign
Anderson	A. Scott	Environmental Defense Fund	UNABLE TO ATTEND
Brown*	Nancy J.	Lawrence Berkeley National Laboratory	<i>Nancy Brown</i>
Cavens	Jessica J.	EnCana Oil & Gas (USA)	<i>Jessica Cavens</i>
Daugherty	William S.	NGAS Resources, Inc.	
Dwyer	James P.	Baker Hughes	
Hall	Jeffrey D.	Devon Energy Corporation	
Hall	J. Chris	Drilling Production Co.	
Hardage*	Bob	University of Texas at Austin	<i>Bob Hardage</i>
Julander	Fred C.	Julander Energy Company	
Levey*	Raymond A.	University of Utah	UNABLE TO ATTEND
Mark	Sandra D.	Black Hills Exploration and Production	<i>Sandra Mark</i>
Mohaghegh*	Shahab D.	West Virginia University	<i>Sh. Mohaghegh</i>
Sparks	Don L.	Discovery Operating, Inc.	<i>Don Sparks</i>
Tew	Berry H. "Nick"	State Oil and Gas Board of Alabama	UNABLE TO ATTEND
Weiss	Janet	BP America, Inc.	UNABLE TO ATTEND
Zinke	Sally G.	Ultra Petroleum	UNABLE TO ATTEND

* Special Government Employee

Unconventional Resources Technology Advisory Committee Meeting

Public Walk-In List - October 15-16, 2009

Last Name	First Name	Organization
Beach	Steve	RPSEA
Buckingham	Chris	Southwest Research Institute
Haut	Rich	RPSEA
Ming	Mike	RPSEA
Sadek	Hani	RPSEA
Schroeder	Art	RPSEA
Schroeder	Charlotte	RPSEA
Siegfried	Bob	RPSEA

*Unconventional Resources Technology Advisory Committee Meeting
September 15-16, 2009*

DOE Staff Roster

U.S. Department of Energy – Office of Oil and Natural Gas

CDW	Guido DeHoratiis Acting Deputy Assistant Secretary	Designated Federal Officer
	Elena Melchert Program Manager for Section 999	Committee Manager

National Energy Technology Laboratory

BAC JW JG PD	Roy Long	Strategic Center for Natural Gas & Oil
	Gary Covatch	Strategic Center for Natural Gas & Oil
	Ginny Weyland	Strategic Center for Natural Gas & Oil
	George Guthrie	Office of Research and Development
	Phil Dipietro	Office of Systems, Analysis, and Planning

Technology & Management Services, Inc.

ML JRM WAP	Karl Lang	Meeting Minutes Recorder/Facilitator
	Rob Matey	Meeting General Support
	Janie Castillo	Registration Support
	William Pike	General Support

Attachment 3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	9/15/2009 DOE URTAC: 2010 DRAFT ANNUAL PLAN COMMENTS (with assigned topic areas)	EXECUTIVE SUMMARY (& POLICY)	TECHNOLOGY TRANSFER	2007, 2008, 2009 PORTFOLIO ASSESSMENT	METRICS & BENEFITS ASSESSMENT	2010 PROGRAM	Environmental and Prior Recommendation Review	ADMIN & EDITORIAL COMMENTS									
										NEAR TERM ISSUES	ENVIRONMENTAL	SOLICITATIONS	OTHER PETROLEUM RESOURCE	REGULATION	WATER & ENVIRONMENTAL MNGMNT	PRODUCTION RESEARCH	EXPLORATION RESEARCH
3	2007	X	X		X						X			X	X	X	X
4	2008	X	X									X	X				
5	2009	X	X				X			X	X						
6	2010	X	X	X	X	X	X										
8	COMMENTS FROM DON SPARKS:																
9	The following areas are of importance:																
10	<u>Unconventional Resource</u>																
11	1. Resource Assessment																
12	a. Resource assessment (p. 28)																
13	b. Geosciences (p. 28)																
14	c. Basin Analysis & Resource Exploitation (p. 29)																
15	2. Early Stage Research or novel concepts.... (p. 30)																
16	3. Develop and execute innovative approaches(p. 30)																
17	<u>Drilling/completion/water management</u>																
18	d) drilling (p. 29)																
19	e) stimulating and completion (p. 29)																
20	f) water management (p. 29)																
21	i) environmental (p. 30)																
22	<u>Small Producers</u>																
23	1. <u>Methods to reduce field operating costs</u>																
24	Water Management (p. 36)																
25	Reducing production related costs (p. 36)																
26	Cost effective intelligent well monitoring (p. 36)																
27	Creative capture & reuse of industrial waste (p. 37)																
28	2. <u>Methods to increase oil and gas recovery</u>																
29	How to extend economic life (p. 36)																
30	Improved methods for well completions (p. 36)																
31	Leverage existing wellbores to maximize additional hydrocarbons (p. 37)																
32	Novel concepts to increase production (p. 37)																
33																	
34	COMMENTS FROM SANDRA MARK:																
35	General comments:																
36	For many of the technology areas, the term shale gas is too restrictive.																
37	There is a need for research on oil shales, and we still have not figured out tight sands (both oil and gas).																
38	For virtually every instance, I would do a search (shale gas) and replace with "oil and gas shales and tight sands."																
39	So the DOE has been spending lots of money to help figure out how to produce gas from the Piceance, even as the industry is running away screaming because of environmental restrictions there.																
40	Another example--there are lots of deals out there right now, and most companies I know aren't even looking at those on Federal lands. I believe that we need to keep reminding the DOE and politicians of these sorts of problems.																
41																	
42	Specific comments:																
43	Page 25. Frontier Area, Frontier category. Confusing text, and is it 10 or 15%? It probably needs to be higher, whichever it is.																

Attachment 4

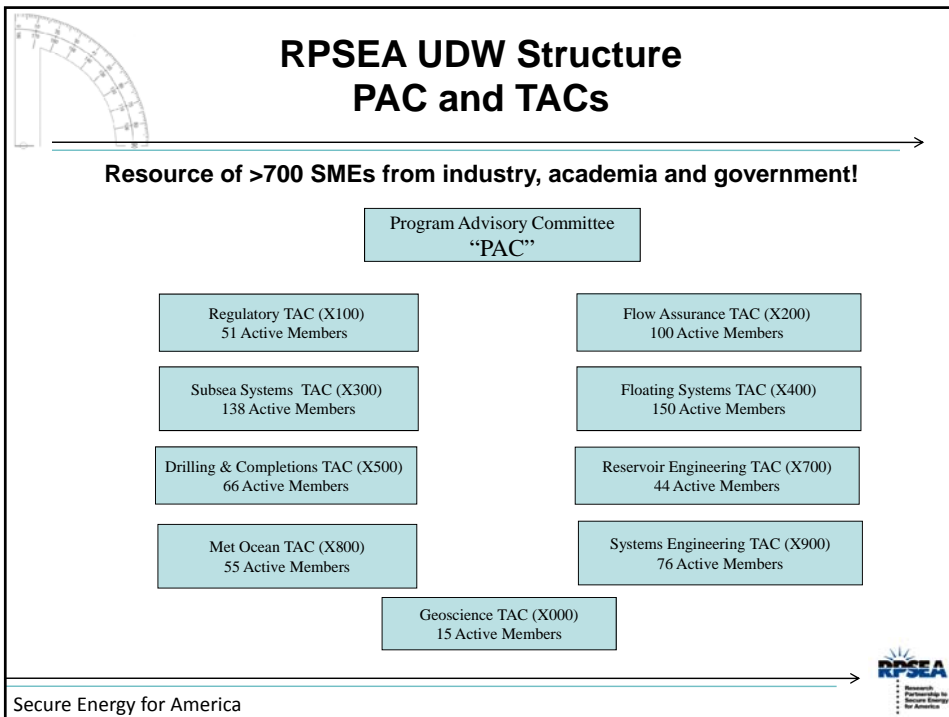


FACA review RPSEA; 2010 Annual Plan Overview

C. Michael Ming
Hani Sadek; VP, UDW
September 16/17, 2009



Secure Energy for America



International Collaboration UDW Program Input

International

Professional Societies

**RPSEA;
Invited Organization**

Regional and local

Universities

Secure Energy for America

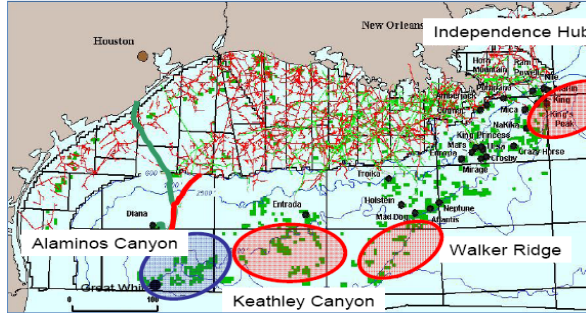
UDW Program is “Technology and Architecture Focus”

Ultra-Deepwater Resources. Awards from allocations under section 999H(d)(1) shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater.

Secure Energy for America

UDW Program Approach

Four base-case field development scenarios



The Challenges

- Walker Ridge/Keathley Canyon**
- subsalt
 - deeper wells
 - tight formations

- Alaminos Canyon**
- viscous crude
 - lacking infrastructure

- Eastern Gulf – Gas Independence Hub**
- higher pressure & temperature
 - CO₂/H₂S

- Overall**
- higher drilling costs
 - challenging economics

Secure Energy for America



Increasing Lag Between Discovery and Development

Proven Reserves Add Value

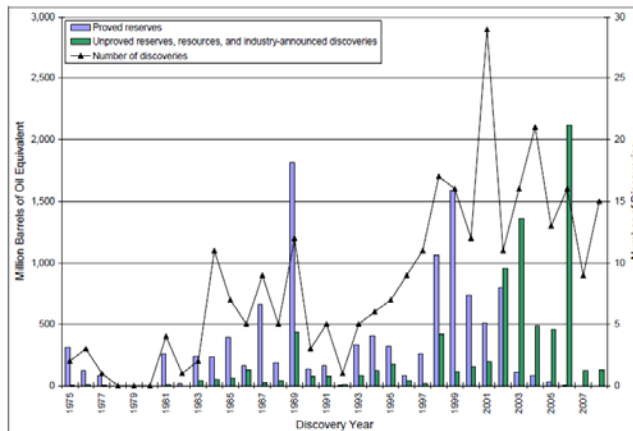


Figure 22. Number and volume of deepwater discoveries. Volumes include MMS reserves, MMS resources, and industry-announced discoveries.

MMS Report 2009 – 016: Deepwater Gulf of Mexico 2009. (continuing trend from 2008-013 report)

Secure Energy for America



Need to reduce costs

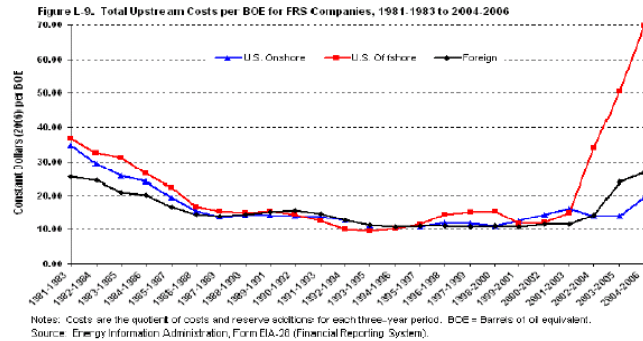


Figure 5. Cost per Barrel of Oil Equivalent (BoE) per US Department of Energy, Energy Information Agency (EIA) January 2008, for companies reporting to EIA's Financial Reporting System (FRS). It does not include state-owned oil companies. <http://www.eia.doe.gov/inec/info/sheets/crudeproduction.html>

Secure Energy for America



UDW Program Goal

The goal of the UDW is to exploit the ultra-deepwater resource base and **to convert currently identified (discovered) resources into economic recoverable (proven) reserves**, while protecting the environment, thereby providing the U.S. consumer with secure and affordable petroleum supplies.

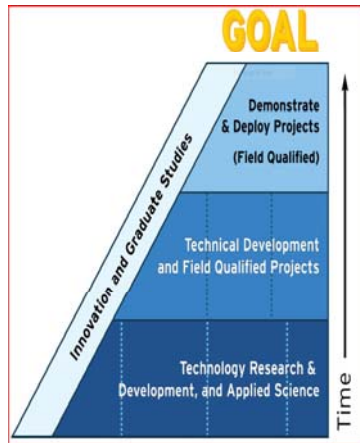
This goal will be achieved by:

- Increasing production of ultra-deepwater oil and gas resources
- Reducing costs & cycle time to find, develop, and produce such resources
- Increasing the efficiency of exploitation of such resources
- Increasing production efficiency and ultimate recovery of such resources
- Improving safety and environmental performance by minimizing environmental impacts associated with ultra-deepwater exploration and production

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UDW Program Objectives



Near Term

Objective 1: Ongoing Identification of Technology UDW Needs

Objective 2: Technology Research & Development, & Applied Science

Objective 3: Awareness and Cost-Share Development.

Longer Term

Objective 4: Technical Development and Field Qualified

Objective 5: Environmental & Safety Technology Development & Deployment

Objective 6: Technology Demonstration.

Objective 7: Technology Commercialization and Industry Deployment

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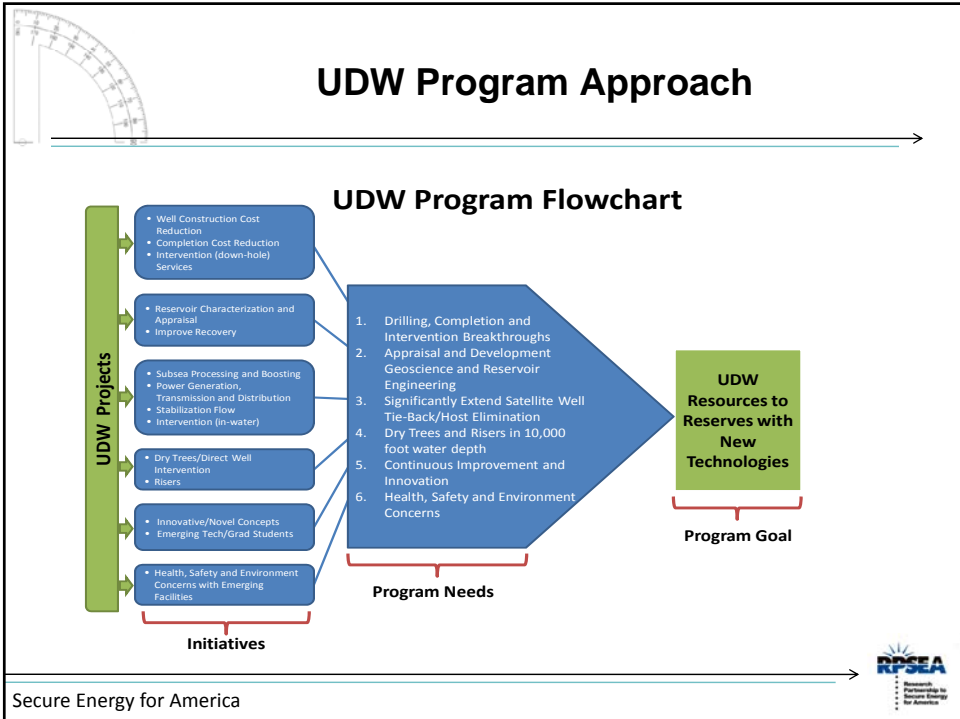
UDW Program 'Needs'

1. Drilling, completion and intervention breakthroughs
2. Appraisal & development geoscience and reservoir engineering
3. Significantly extend subsea tieback distances & surface host elimination
4. Dry trees/direct well intervention and risers in 10,000' wd
5. Continuous improvement / optimize field development
 - Per wellbore recovery
 - Cost reduction
 - Reliability improvements
 - Efficiency improvements
6. Associated safety and environmental trade-offs

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UDW Program Approach



Programmatic approach “Need 1” (drilling) Example

Need 1: Drilling, Completion, and Intervention Breakthroughs

Benefit: Drilling, completion, and intervention costs now represent 50 to 70 percent of the total capital expenditures on UDW projects. With ultra-deepwater drilling spread cost exceeding \$1 million per day, significant cost reduction is required for UDW project viability.

Initiative 1: Well Construction Cost Reduction

Target: Reduce ultra-deepwater drilling costs by 30 percent

DW1501 (2007): Extreme Reach Development (not awarded – to be re-bid in 2010)

This project will conceptualize the tools and service capabilities required to safely drill, complete, produce, maintain, and at end of life abandon reservoirs located up to 20 miles away from the surface facilities and well access point.

DW2501 (2008): Early Reservoir Appraisal Utilizing a Low Cost Well Testing System (Note: This project also supports Need #2, Initiative 1: Reservoir Characterization and Appraisal)

DW2502 (2008): Modeling and Simulation of Managed Pressure Drilling (MPD)

This project will expand existing capabilities for analysis and simulation of MPD ultra-deepwater well design and operations.

DW35xx (2009): Drilling

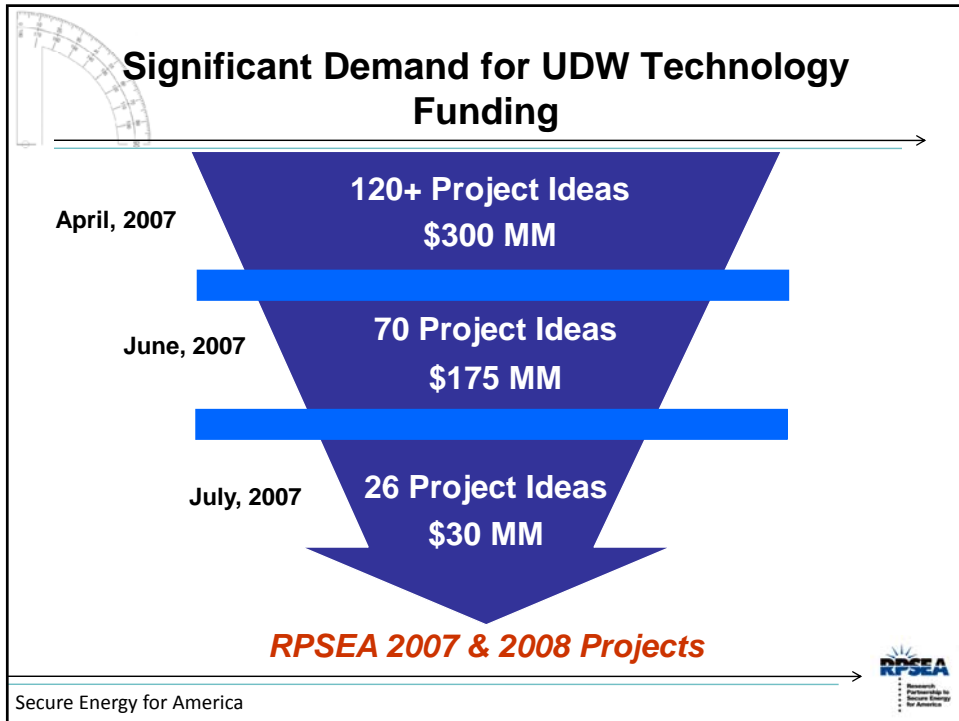
Proposals under this drilling initiative are expected to have the potential to significantly reduce the cost of UDW well drilling operations.

Concepts addressed may include:

- To reduce the single MODU spread cost
- To reduce the total well count ...
- A longer-term approach may be to develop a seafloor based drilling rig

DW45xx (2010): Extreme Reach Development

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2007 UDW Projects

Project	Project Title	Contracted; lead	Award (RPSEA portion)
DW1201	Wax Control	University of Utah	\$400,000
DW1301	Improvements to Deepwater subsea measurements	Letton Hall Group	\$3,564,000
DW1302	High Conductivity Umbilicals	Technip	\$448,000
DW1401	Composite Riser for UDW High Pressure Wells	Lincoln Composites	\$1,680,000
DW1402	Deepwater dry tree system for drilling production	FloTec / Houston Offshore	\$936,000
DW1403	Fatigue Performance of High Strength Riser Materials	SwRI	\$800,000
DW1501	Extreme Reach Development	Tejas (unable to contract - \$200,000)	
DW1603	Design investigation xHPHT, SSSV	Rice Univ.	\$120,000
DW1603	Robotic MFL Sensor; monitoring & inspecting risers	Rice Univ.	\$120,000
DW1603	Hydrate Plugging Risk	Tulsa Univ.	\$120,000
DW1603	Hydrate Characterization & Dissociation Strategies	Tulsa Univ.	\$120,000
DW1701	Improved Recovery	Knowledge Reservoir	\$1,600,000
DW1801	Effect of Global Warming on Hurricane Activity	NCAR	\$560,000
DW1901	Subsea processing System Integration	GE Research	\$1,200,000
DW1902	Deep Sea Hybrid Power Systems:	HARC	\$480,000
DW2001	Geophysical Modeling Methods	SEG	\$2,000,000
15 awarded			\$14,148,000

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2008 UDW Projects

Project	Project Title	Selected; lead	Approx. RPSEA share
DW 2101	New Safety Barrier Testing Methods	Southwest Research Institute	\$128,000
DW 1202	EOS improvement for XHPHT	NETL (\$1,600, 00)	
DW 2201	Heavy Viscous Oils PVT for Ultra-Deepwater	Schlumberger Limited	\$460,000
DW 2301	Riserless Intervention System (RIS)	DTC International	\$3,411,500
DW 1502	Coil Tubing, Drilling and Intervention Systems Using Cost Effective Vessel	Nautilus International, LLC	\$820,000
DW 2501	Early Reservoir Appraisal, Utilizing a Well Testing System	Nautilus International, LLC	\$880,000
DW 2502	MPD: Advanced Steady-State and Transient, Three-Dimensional, Single and Multiphase, Non-Newtonian Simulation System for Managed Pressure Drilling	Stralagnetic Software, LLC	\$384,000
DW 2701	Resources to Reserves Development and Acceleration through Appraisal	TBA	\$400,000
DW 2801	Gulf 3-D Operational Current Model Pilot	TBA	\$1,248,000
DW 2901	Ultra-Reliable Deepwater Electrical Power Distribution System and Power Components	GE Global Research	\$4,811,000
DW2902-02	Technologies of the Future for Pipeline Monitoring and Inspection	University of Tulsa	- \$150,000
DW2902-03	Wireless Subsea Communications Systems	GE Global Research	- \$150,000
DW2902-04	Replacing Chemical Biocides with Targeted Bacteriophages in Deepwater Pipelines and Reservoirs	Phage Biocontrol, LLC	- \$150,000
DW2902-06	Enumerating Bacteria in Deepwater Pipelines in Real-Time at a Negligible Marginal Cost Per Analysis: A Proof of Concept Study	Livermore Instruments, Inc.	- \$150,000
DW2902-07	Fiber Containing Sweep Fluids for Ultra-Deepwater Drilling Applications	University of Oklahoma	- \$150,000
15 Projects		13 selected	\$12,542,500

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2009 UDW Plan Strategy

- 6 Initiative-based RFPs (6 to 10 project awards)
- Unlike 2007 and 2008, UDW TACs have not voted for individual projects. Rather, the TACs prioritized project ideas by initiatives.
- This input was evaluated by the PAC to decide appropriate balance for 2009 UDW program.
- UDW 2009 RFPs will consist of both specific projects and broader initiative-based requests.
- Timing; anticipate release of RFPs September 2009 with 60 day clock, selection 1Q2010 and awards 2Q2010



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2009 UDW Funding

RPSEA YR3 Funding Allocation (2009)		Funding Distribution (\$k)		
	Title / Description	Low	High	Average
Need #1	Drilling Completion and Intervention Breakthroughs			6,250
1	Drilling	2,000	5,000	3,500
2	Completions	1,000	3,000	2,000
3	Intervention (Downhole Services)			-
4	Intervention (In-Water IMR)	500	1,000	750
5	Extended Well Testing			-
Need #2	Appraisal & development geosciences and reservoir engineering			1,500
6	Reservoir Surveillance	1,000	2,000	1,500
Need #3	Significantly extend subsea tieback distances / surface host elimination			3,625
7	Stabilized Flow	750	1,500	1,125
8	Subsea Power			-
9	Subsea Processing, Pressure Boosting, Instrumentation and Controls	2,000	3,000	2,500
Need #4	Dry trees / Direct well intervention and risers in 10,000' wd.			-
10	Riser Systems			-
11	Dry Tree Structures			-
Need #5	Continuous Improvement / Optimize field development			3,000
12	Long Term Research and Development and Graduate Student Program	1,000	2,000	1,500
13	Sensors, tools and Inspection Processes	1,000	2,000	1,500
14	Bridging and Contingency	500	750	625
Need #6	Associated Safety and Environmental Concerns			500
15	Environmental Issues	250	750	500
		10,000	21,000	14,875

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2010 UDW RFPs

- ~ \$15 million (RPSEA) + cost share available for project awards.
- Target funding of three to five large projects, with a value of \$1 million to \$5 million / project.
 - Additionally, a number of smaller awards averaging \$150 - \$300K thousand under Need 5: Continuous Improvement and Innovation.
 - Each project will have a duration of one to three years.
- Projects will be aligned with the six UDW needs.
- Project integration across multiple disciplines will be encouraged (e.g. geoscience, reservoir and drilling, or flow assurance and subsea).
- Proposed UDW 2010 RFPs can be categorized into three types:
 1. Next phase projects based on completed projects from the 2007 and 2008 program
 2. Specific project ideas to fill-in identified technical gaps
 3. Graduate student and innovative /novel projects

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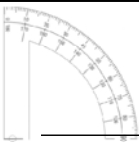


2010 UDW Activities

- Project management & technology transfer; 2007 and 2008 projects.
- Bid, review, select, negotiate & award 2009 projects
- Bid, review, select, negotiate & award 2010 projects
- Gather input, review and adjust as appropriate Program objectives and technology needs
- Prepare 2011 draft Annual Plan
- Collaborate with NETL Complementary and Metrics Program
- Address input & issues from FACA and government agencies (MMS, USCG, GAO, etc.) and NGOs


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Technology Transfer Approaches

- Engagement of PAC and TAC Members
 - Project selection and review
 - Participation in field tests as “early adopters”
 - Quarterly TAC meetings are an important aspect of ongoing tech transfer
 - Working Committee (cost share partners)
- Active Coordination with NETL on Knowledge Management Database (KMD)
- RPSEA Website Enhancement
 - Project information
 - Program direction
- 2.5% set-aside for each subcontract
 - 1.5% Project Level
 - 1% Program Level






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20




Project-Level Technology Transfer

- Funded by 1.5% Set-aside
- Managed by subcontractors (with RPSEA final approval)
 - Project-specific websites
 - Participation in conferences, workshops
 - Preparation of articles for journals, trade publications



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21




Program-Level Technology Transfer

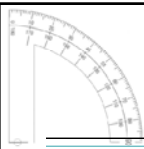
- Funded by 1% Set-aside
- Managed by RPSEA
 - Website Enhancements
 - Coordination with NETL KMD,
 - Events at Major Technical Conferences (SPE, OTC, SEG, etc.)

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22





Questions?



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23



Attachment 5

2007 Portfolio Overview

2007 Program Selections				
	Small Producer	Unconventional Resources	Ultra-Deepwater	Total
Universities	6	13	5	24
For Profits	0	1	8	9
Non-Profits	0	1	4	5
National Labs	1	2	0	3
State Agencies	0	2	0	2
Total Selected	7	19	17	43 *

* 42 of 43 awarded



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3

2008 Ultra Deepwater Program Solicitation

Number of Proposals

	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	15	0	1	0	8	24
Selected	8	0	1	0	2	11*
Awarded						0

* 2 additional selections pending

Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	32,713	24,529	8,184	25
Selected	13,540	10,748	2,790	21



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2008 Unconventional Resources Program Solicitation

Number of Proposals

	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	22	2	5	5	35	69
Selected	1	1	2	0	5	9
Awarded	1		2		3	6

Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	103,892	49,941	53,951	52
Selected	28,592	18,361	10,231	36

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2008 Small Producer Program Solicitation

Number of Proposals

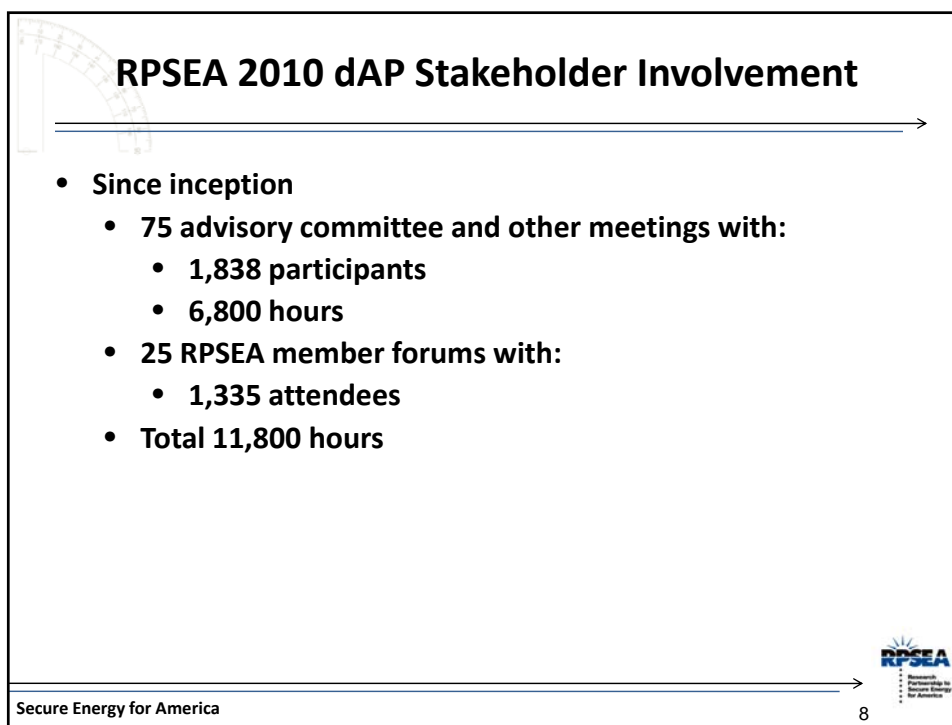
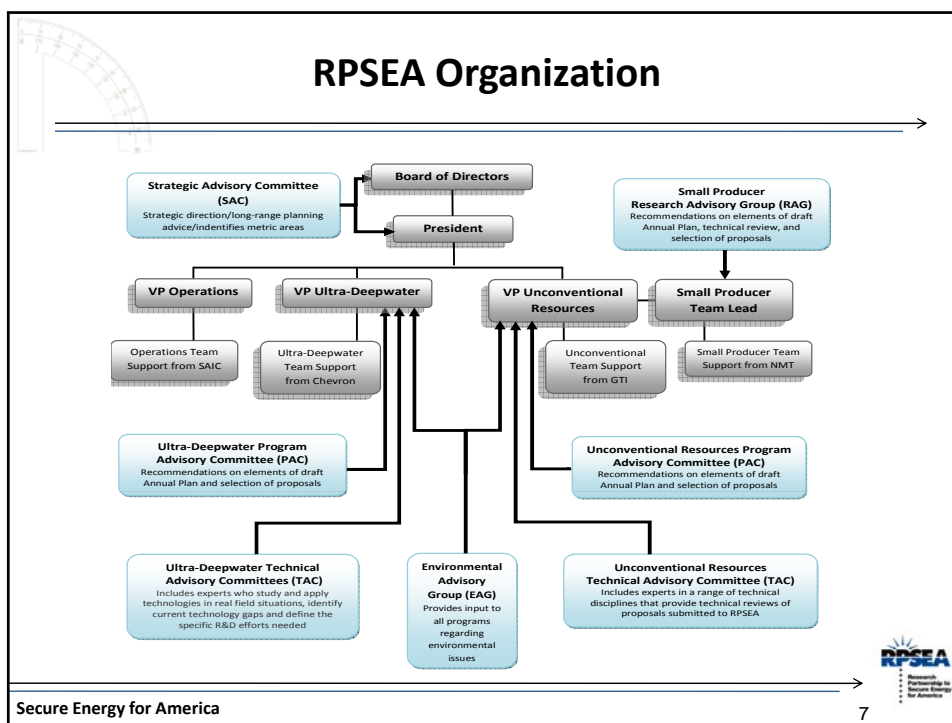
	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	7	2	1	0	7	17
Selected	2	0	0	0	4	6
Awarded					1	1

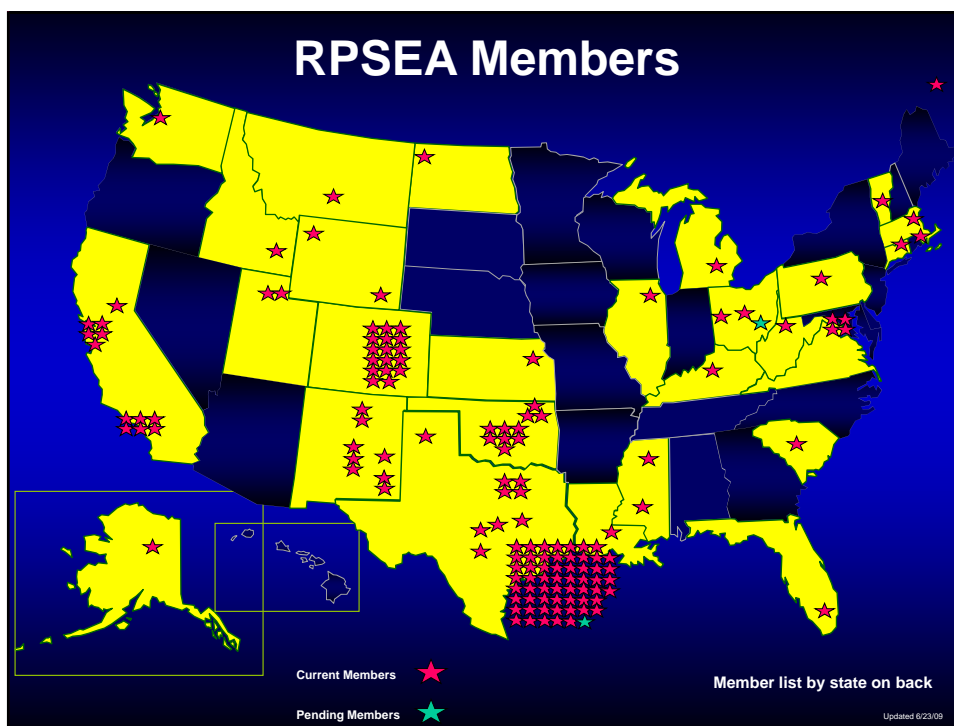
Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	17,059	8,993	8,066	47
Selected	6,847	3,141	3,706	54

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Alaska University of Alaska Fairbanks	Louisiana State University	Apache Corporation Apex Spectral Technology BP America, Inc. Baker Hughes Incorporated BJ Services Cameron/Curtiss-Wright EMD Capstone Turbine Corporation CARBO Ceramics, Inc. City of Sugar Land ConocoPhillips Company CSI Technologies, Inc. Deepwater Structures, Inc. Deepwater XLP Technology, LLP Det Norske Veritas (USA) Energy Valley, Inc. ExxonMobil Corporation GE/VetcoGray Grantherme, Inc. Greater Fort Bend Economic Development Council GSI Environmental, Inc. Halliburton Houston Advanced Research Center Houston Offshore Engineering, LLC Houston Technology Center Intelligent Agent Corporation Knowledge Reservoir, LLC Marathon Oil Company M&H Energy Services Merrick Systems, Inc. Nalco Company NanoRidge Materials, Inc. National Oilwell Varco, Inc. Nautilus International, LLC Noble Energy, Inc. OTM Consulting Ltd. Oxane Materials, Inc. Petris Technology, Inc. Petrobras America, Inc. Pioneer Natural Resources Company QO Inc. Quanelle, LLC Rice University Rock Solid Images RTI Texas Schlumberger Limited Shell International Exploration & Production Simmons & Company International	SiteLark, LLC Southern Methodist University Southwest Research Institute StatoilHydro Stress Engineering Services, Inc. Technip Technology International Tejas Research & Engineering, LP Tenaris Texas A&M University Texas Energy Center Texas Independent Producers and Royalty Owners Association Texas Tech University The University of Texas at Austin Titanium Engineers, Inc. TOTAL Exploration Production USA University of Houston VersaMarine Engineering, LLC Weatherford International Ltd.
California AeroVironment, Inc. Campbell Applied Physics Chevron Corporation Conservation Committee of California Oil & Gas Producers Delco Oheeb Energy, LLC Drilling & Production Company Lawrence Berkeley National Laboratory Lawrence Livermore National Laboratory Natural Carbon, LLC Stanford University University of Southern California Watt Mineral Holdings, LLC	Massachusetts Massachusetts Institute of Technology Woods Hole Oceanographic Institution	Utah Novatek, LLC The University of Utah	Vermont New England Research, Inc.
Colorado Altria Group LLC Bill Barrett Corporation Brownstein Hyatt Farber Schreck, LLP Colorado School of Mines Colorado Oil & Gas Association DCP Midstream, LLC The Discovery Group, Inc. Energy Corporation of America EnCana Corporation Gunnison Energy Corporation HW Process Technologies, Inc. Independent Petroleum Association of Mountain States Leede Operating Company NICO Resources Robert L. Bayless, Producer LLC Spatial Energy University of Colorado at Boulder	Michigan University of Michigan	Virginia Advanced Resources International, Inc. American Gas Association Independent Petroleum Association of America Integrated Ocean Drilling Program	Washington Quest Integrated, Inc.
Connecticut APS Technology, Inc.	Mississippi Jackson State University Mississippi State University	West Virginia West Virginia University	Wyoming EnerCrest, Inc. WellDog, Inc.
Florida Florida International University	Montana Nanco Resources	New Mexico Correlations Company Harvard Petroleum Corporation Independent Petroleum Association of New Mexico Los Alamos National Laboratory New Mexico Institute of Mining and Technology New Mexico Oil & Gas Association Sandia National Laboratories Strata Production Company	Newfoundland, Canada Centre for Marine CNG, Inc.
Idaho Idaho National Laboratory	New Mexico Correlations Company Harvard Petroleum Corporation Independent Petroleum Association of New Mexico Los Alamos National Laboratory New Mexico Institute of Mining and Technology New Mexico Oil & Gas Association Sandia National Laboratories Strata Production Company	North Dakota Western Standard Energy Corporation	
Illinois Gas Technology Institute	Ohio NGO Development Corporation The Ohio State University Wright State University	Oklahoma Chesapeake Energy Corporation Devon Energy Corporation Interstate Oil and Gas Compact Commission K. Stewart Energy Group Oklahoma Independent Petroleum Association Petroleum Technology Transfer Council The Fleischaker Companies The University of Oklahoma The University of Tulsa Williams	
Kansas The University of Kansas	Pennsylvania The Pennsylvania State University	South Carolina University of South Carolina	
Kentucky NGAS Resources, Inc.	Texas Acute Technological Services, Inc. Anadarko Petroleum Corporation		
Louisiana			

RPSEA 2010 dAP Objectives


- Meet EPACKT 2005 objectives
- Enhance the traditional iterative industry process by:
 - Developing a time scaled R&D process
 - Identifying and enabling the relevant scientific overlay not feasible with pure market driven efforts
 - Facilitate collaboration among industry and researchers through integrated projects in a well designed integrated portfolio

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11




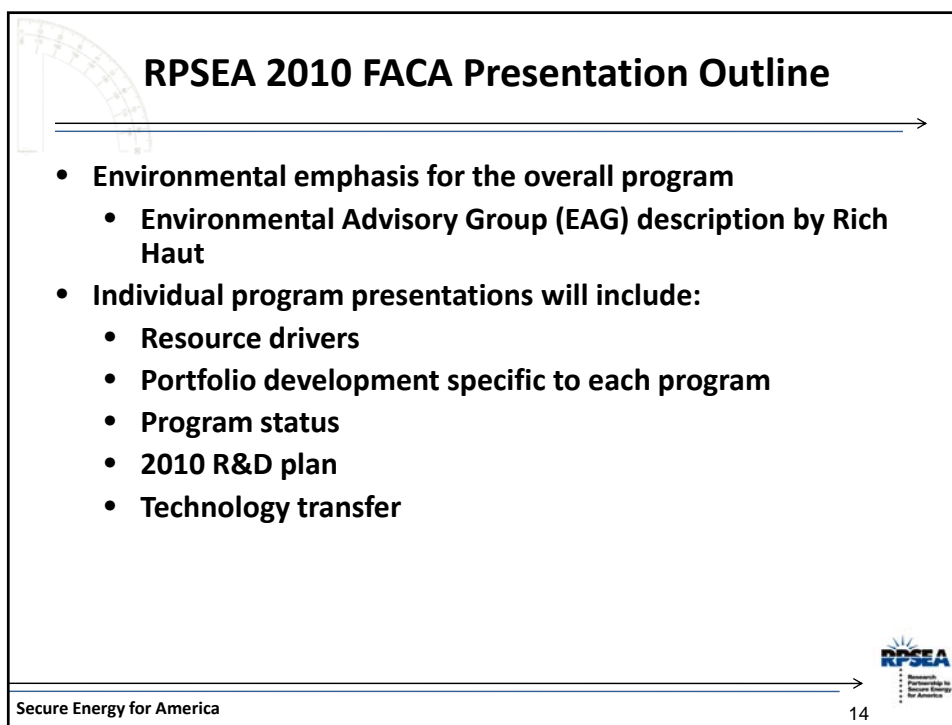
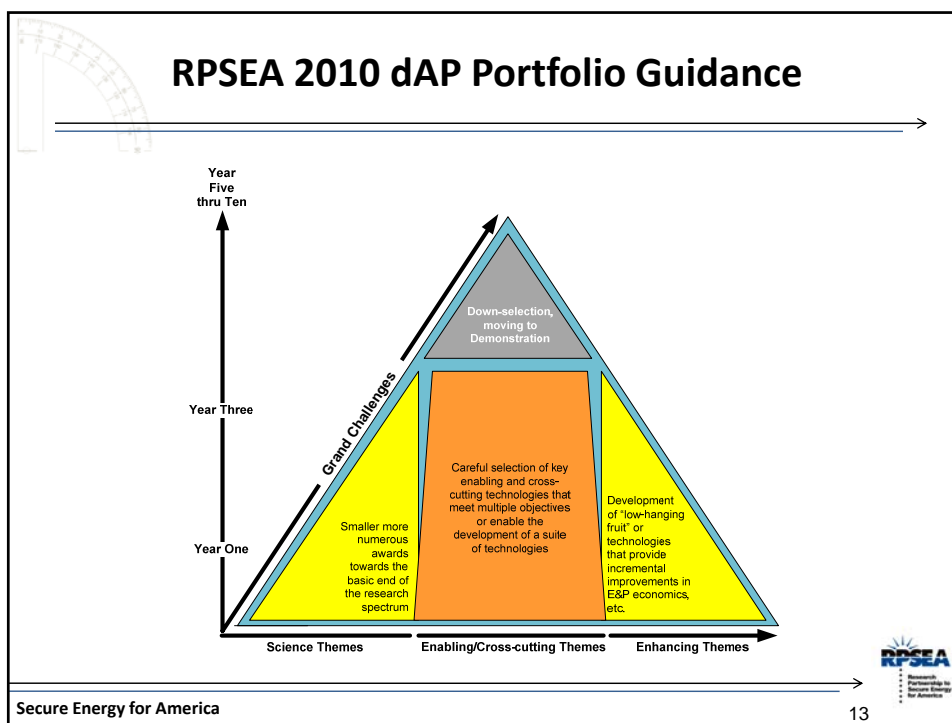
RPSEA 2010 dAP Process Flow



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12





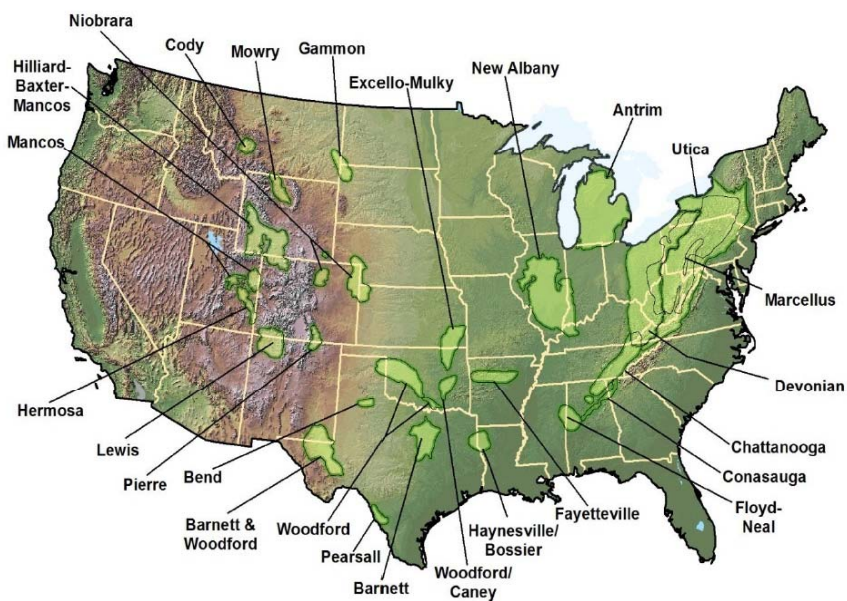
Onshore Programs

- **Unconventional Resources**
 - Portfolio Development
 - Program Status
 - Input to 2010 Plan
 - Summary of 2010 Plan
- **Small Producer**
 - Objective
 - Program Status
 - Input to 2010 Plan
 - Summary of 2010 Plan
- **Technology Transfer**

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U.S. Unconventional Shale Gas Plays



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



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2010 Draft Annual Plan – Unconventional Onshore Program

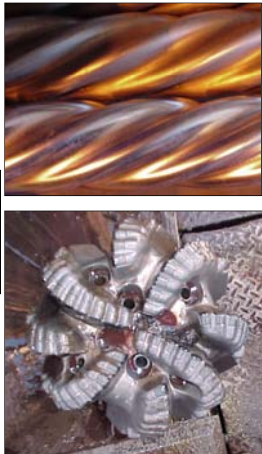
- **Mission & Goal**
 - Unchanged from 2007-2009
 - Economically viable technologies to allow environmentally acceptable development of unconventional gas resources
 - Gas Shales
 - Tight Sands
 - Coalbed Methane
- **Objectives**
 - **Near Term**
 - Increase production & recovery from established unconventional gas resources, accelerate development of existing & emerging plays
 - Decrease environmental impact of unconventional gas development
 - Integrate project results & deliverables and engage in technology transfer to ensure application of program results
 - **Longer Term**
 - Technologies for high-priority emerging & frontier resources




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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



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RPSEA Unconventional Gas Program Components & Approach

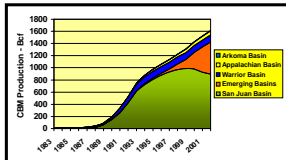
- Resource Assessment
- Drilling
- Exploration Technologies
- Stimulation & Completion
- Reservoir Description & Engineering
- Environmental & Water Management

Integrated Basin Analysis

Technology Dissemination

Impact By Geologic Basin and Unconventional Resource

e.g., CBM



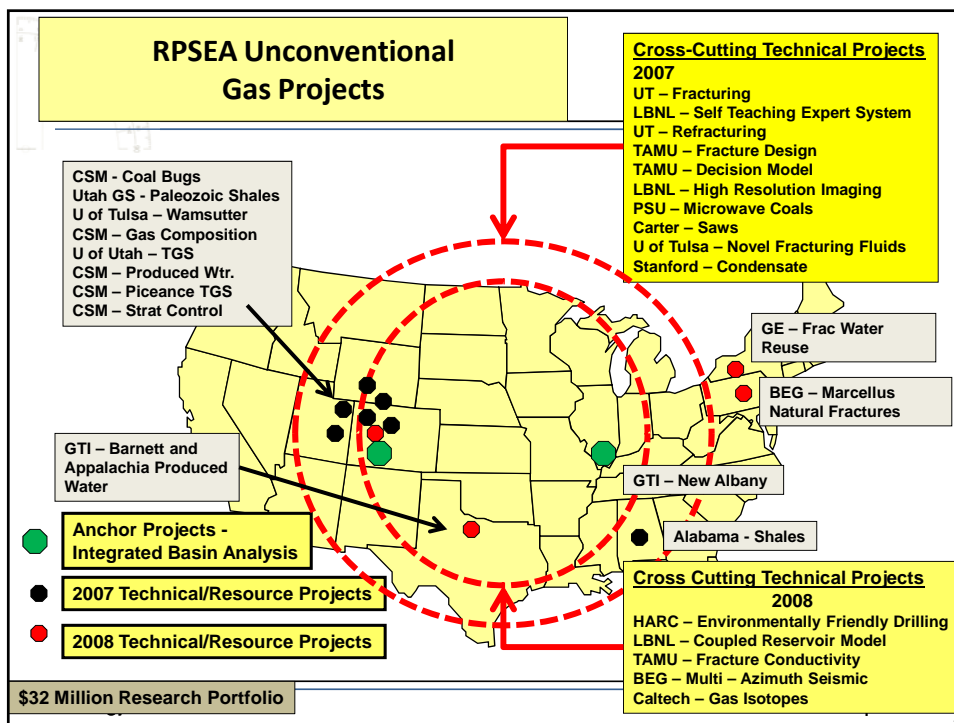
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	CBM 10%	Gas Shales 45%	Tight Sands 45%						
Integrated Basin Analysis									
Drilling									
Stimulation and Completion									
Water Management									
Environmental									
Reservoir Description & Management									
Reservoir Engineering									
Resource Assessment									
Exploration Technologies									
<table border="1" style="margin: auto;"> <tr> <td style="background-color: #92d050; text-align: center;">H</td> <td>High Priority</td> </tr> <tr> <td style="background-color: #ffff00; text-align: center;">M</td> <td>Medium Priority</td> </tr> <tr> <td style="background-color: #ffcc00; text-align: center;">L</td> <td>Low Priority</td> </tr> </table>				H	High Priority	M	Medium Priority	L	Low Priority
H	High Priority								
M	Medium Priority								
L	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
Drilling			
Stimulation and Completion	Microwave CBM (Penn) \$0.8	Cutters (Carter) \$.09 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22
Water Management	Integrated Treatment Framework (CSM) \$1.56		
Environmental			
Reservoir Description & Management		Hi Res. Imag. (LBNL) \$1.1	Tight Gas Exp. System (LBNL) \$1.7
Reservoir Engineering		Decision Model (TEES) \$.31	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52
Resource Assessment		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67
Exploration Technologies	Coal & Bugs (CSM) \$.86		
2008 Program Priorities	H	High Priority	2007 Projects
	M	Medium Priority	
	L	Low Priority	

	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) \$.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
Water Management	Integrated Treatment Framework (CSM) \$1.56	Barnett & Appalachian (GTI) \$2.5	Frac Water Reuse (GE) \$1.1
Environmental	*	Environmentally Friendly Drilling (HARC) \$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
Reservoir Engineering		Decision Model (TEES) \$31 Coupled Analysis (LBNL) \$2.5	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52
Resource Assessment		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67
Exploration Technologies	Coal & Bugs (CSM) \$.86	Multi-Azimuth Seismic (BEG) \$1.1	
2008 Program Priorities	H	High Priority	2007 Projects
	M	Medium Priority	2008 Projects
	L	Low Priority	

23



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 – Anchor Project Recommendation
- **Additional Project Management Staff Added**
 - Increasing number of projects
 - Need for active integration of projects into program
- **2009 RFP, 2010 Plan Structured to Build Upon Existing Program**



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Last Year: 2009 Draft Annual Plan – Onshore Program

- **Solicitation Flexibility to Build an Integrated Program**
 - Tailor 2009 solicitations to fill gaps in 2007/2008 portfolio
 - Current areas needing additional emphasis (**last year**)
 - Appalachian region
 - Decreasing environmental footprint
 - Water management
 - Complex, multi-zone completions
- **2009 Solicitation**
 - 2008 Selections addressed areas above
 - Solicitation seeks a third anchor project in a shale, Appalachian Basin encouraged
 - Basics of production and stimulation in low-permeability reservoirs
 - Preliminary studies of novel concepts



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2009 Research Focus Recommendations – 2008 Selections

- **Geosciences**
 - Multiazimuth Seismic Diffraction Imaging for Fracture Characterization in Low-Permeability Gas Formations
 - Evaluation of Fracture Systems and Stress Fields within the Marcellus Shale and Utica Shale and Characterization of Associated Water-Disposal Reservoirs: Appalachian Basin
- **Basin Analysis**
 - Novel Gas Isotope Interpretation Tools to Optimize Shale Gas Production
 - Stratigraphic Controls on Higher-than-average Permeability Zones in Tight-gas Sands in the Piceance Basin
 - Coupled Flow-Geomechanical-Geophysical-Geochemical Analysis of Tight Gas Production
- **Stimulation and Completion**
 - Sustaining Fracture Area and Conductivity of Gas Shale Reservoirs for Enhancing Long-Term Production and Recovery
- **Water Management**
 - Barnett and Appalachian Shale Water Management and Reuse Technologies
 - Pretreatment and Water Management for Frac Water Reuse and Salt Production
- **Environmental**
 - The Environmentally Friendly Drilling Systems Program



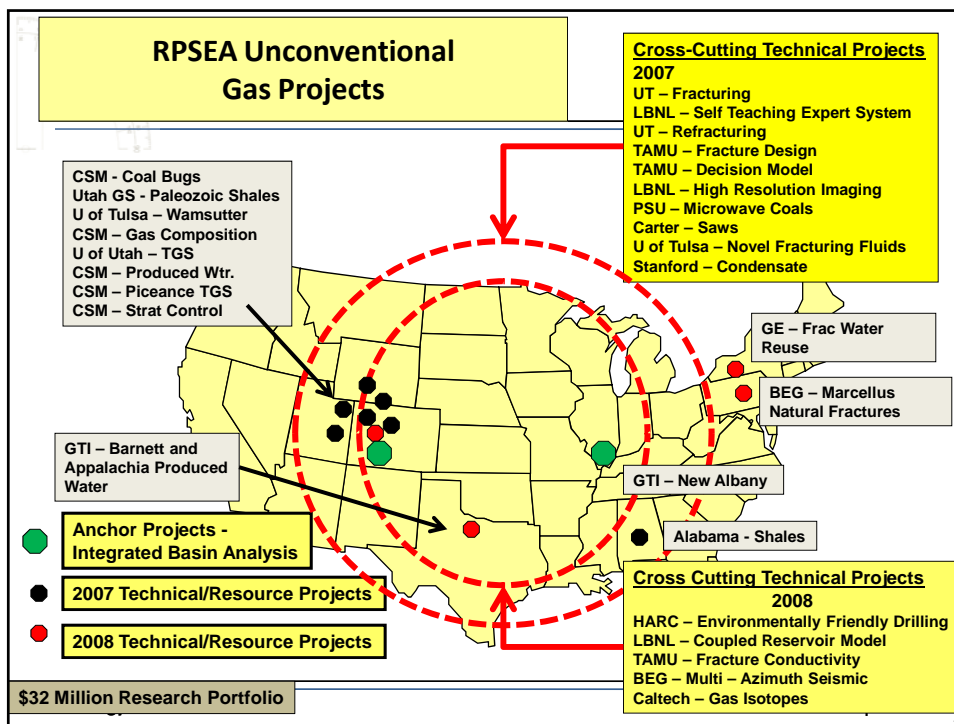
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2010 Draft Annual Plan – Onshore Program Solicitation “Menu”

- **Integrated Program Targeting a Specific Resource**
 - Build on existing projects
 - May be comprehensive or directed toward specific technology area
 - Topic areas (amended as per 2009 URTAC recommendations)
 - Resource Assessment
 - Geosciences
 - Basin Analysis and Resource Exploitation
 - Drilling
 - Stimulation and Completion
 - Water Management
 - Reservoir Description and Management
 - Reservoir Engineering
 - Environmental
- **Early-Stage Research on Novel Concepts for Unconventional Gas Development**
- **Innovative Approaches to Integrate the Results of Individual Projects**



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2010 Draft Annual Plan – Small Producer Program

- **Mission & Goals**
 - Unchanged from 2007-2009
 - Increase supply from mature resources
 - Reduce cost
 - Increase efficiency
 - Improve safety
 - Minimize environmental impact
- **Objectives**
 - Near Term
 - Improve water management & optimize water use
 - Improve oil & gas recovery in mature fields, extending economic life
 - Reduce field operating costs
 - Longer Term
 - Apply developed technologies to new basins/areas and develop new technologies to address the same objectives

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



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Small Producer Program - 2007 Projects & 2008 Selections


- **Thirteen projects addressing concerns of small producers operating mature assets**
 - Produced water treatment
 - Reservoir Characterization (3)
 - Enhanced oil and gas recovery (5)
 - Environmental impact & increased efficiency (3)
 - Improve recovery and sweep efficiency
- **Projects each involve a consortium of researchers and small producers**
- **Small Producer Research Advisory Group (RAG) actively involved**

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32



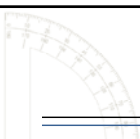





Unconventional Onshore & Small Producer FACA Meeting

C. Michael Ming
Robert W. Siegfried
September 15-16, 2009
San Antonio, TX


Secure Energy for America 1



2010 Draft Annual Plan & Program Updates

- Continued aggressive engagement of the private sector and research communities to enhance the value of the public/ private model created by EPACT Section 999
- Focus on building, maintaining, and managing an optimal and integrated portfolio
- Transition from program planning to program execution
- The 2010 Draft Annual Plan (dAP) is an evolutionary product of the 2007 through 2009 dAPs which laid the foundation for the current R&D portfolio
- Significant increase in proposals from 2007 to 2008
- 2009 UNG & SP RFPs posting is imminent

Secure Energy for America 2



2010 Draft Annual Plan – Small Producer Program

- Awards to be made to Consortia
 - Small producers or organized for the benefit of small producers
 - Small producer: ≤ 1000 BOEPD

- 2010 Annual Plan Solicitations
 - Theme: Advancing Technology for Mature Fields
 - Path to initial application is critical
 - Complement 2007-2009 project selections



2010 Draft Annual Plan – Small Producer Program

- Technology Challenges
 - Water management
 - Improve recovery/extend economic life of reservoirs
 - Reduce field operating costs and decrease environmental impact
 - Well monitoring and reservoir modeling to allow efficient field operations
 - Improved methods for well completions and recompletions
 - Field tests of emerging technology
 - Well and field data management
 - Capture and reuse of waste products to reduce costs or increase recovery
 - Leverage existing wellbores and surface footprint to maximize recovery
 - Novel Concepts to increase production from mature fields

- Other topics addressing the program theme of Advancing Technology for Mature Fields are welcome

Technology Transfer Approaches

- **Engagement of PAC and TAC Members**
 - Project selection and review
 - Participation in field tests as “early adopters”
- **Active Coordination with NETL on Knowledge Management Database (KMD)**
- **PTTC Engagement**
- **RPSEA Website Enhancement**
 - Project information
 - Program direction
- **2.5% set-aside for tech transfer in each subcontract**
 - 1.5% Project Level
 - 1% Program Level


Project-Level Technology Transfer


- **Funded by 1.5% Set-aside**
- **Managed by subcontractors**
 - Project-specific websites
 - Participation in conferences, workshops
 - Preparation of articles for journals, trade publications



Program-Level Technology Transfer


- **Funded by 1% Set-aside**
- **Managed by RPSEA**
 - Website Enhancements
 - Coordination with NETL KMD, PTTC activities
 - Events at Major Technical Conferences (SPE, AAPG, SEG, etc.)
 - Directed publications, e.g. *GasTips*
 - RPSEA Forum Series, e.g. New Albany Shale Forum, June 2009






Secure Energy for America 37

Questions?





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Attachment 6



Knowledge Management Database (KMD) Demonstration

Rand Batchelder, Chris Wyatt, Dale Cunningham
September 15 & 16, 2009



Presentation Identifier (Title or Location), Month 00, 2008

KMD Demonstration

Overview

- **The Federal Advisory Committee Recommended That ORD Develop A Knowledge Management Database That Would Be Used As A Repository for Research and Development Results Related to the Section 999 R&D Program Including:**
 - Program Status
 - **A list of projects goals, objectives, status, accomplishments, reports and key personnel contact information**
 - The RPSEA Consortium R&D Program
 - **57 project summaries currently available on the NETL Internet**
 - NETL Complimentary R&D Program
 - **Drilling under extreme conditions**
 - **Environmental impacts of oil and natural gas development**
 - **Enhanced and unconventional oil recovery**
 - **Resource assessment**
 - Ongoing DOE Oil And Gas Programs
 - Other Related Research Products Generated by the Traditional Oil and Gas Research Program At The NETL SCNGO (e.g. Gas Shale Research)

KMD Demonstration

Design

- The KMD includes a simple entry URL: www.netl.doe.gov/KMD
- A branding logo is included to identify key KMD pages
- An entry portal to the site identifies four options for searching documents and data on oil and gas research
 1. Document Database
 - Provides SQL database search of content using document title and abstract
 - Includes content from the CD/DVD Database, NETL Web site, NETL ProMIS, NETL Morgantown Library, Tulsa Project Office, and OSTI (will include Laramie Project Office [LPO] content in near future)
 - Currently provides links to more than 9,000 files
 2. CD/DVD Database
 - Provides “Google” search of content for indexed files
 - Includes links to all CD/DVDs related to oil and gas research at NETL and content from the NETL site (i.e SCNGO , Section 999, etc.)
 - Currently provides links to more than 5,000 files
 3. Section 999 Database - Includes links to EAct 2005 project summaries
 4. Section 999 Tech Transfer Index - Includes index with links to Technology Transfer products (reports, publications, presentations, etc.)

3

NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

KMD Portal Page



The screenshot shows the KMD Portal Page. At the top, there is a navigation bar with the NETL logo, the text "the ENERGY lab", and the tagline "Where energy challenges converge and energy solutions emerge". Below the navigation bar is a sidebar with a menu of links: ABOUT NETL, KEY ISSUES & MANDATES, RESEARCH, TECHNOLOGIES, ENERGY ANALYSIS, SOLICITATIONS & BUSINESS, EDUCATION, NEWSROOM, and CONTACT NETL. The main content area is titled "Knowledge Management Database (KMD) Portal" and contains a description of the portal's purpose and four search options: Document Database, CD/DVD Database, Section 999 Database, and Section 999 Tech Transfer Index. A "GO" button is located in the top right corner of the page.

4

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KMD Demonstration

KMD Document DB Search Page

NETL the ENERGY lab
Where energy challenges converge and energy solutions emerge

KMD Portal > Document Database

Search the KMD Document Database

This search function allows the user to search all documents (e.g., final reports) from past and current R&D projects. This includes reports from the Office of Research and Development and those available via the Office of Science and Technical Information database. The search is conducted by author or key-word search of titles and document abstracts. See our [instructions](#) for additional information.

TITLE & ABSTRACT: And

AUTHOR:

Search Reset

USA.GOV | U.S. DEPARTMENT OF ENERGY | DOE OFFICE OF FOSSIL ENERGY
DOE OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY | OFFICE OF ELECTRICITY DELIVERY & ENERGY RELIABILITY
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5

NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

KMD Document DB Search Results

NETL the ENERGY lab
Where energy challenges converge and energy solutions emerge

KMD Portal > Document Database

Search the KMD Document Database

This search function allows the user to search all documents (e.g., final reports) from past and current R&D projects. This includes reports from the Office of Research and Development and those available via the Office of Science and Technical Information database. The search is conducted by author or key-word search of titles and document abstracts. See our [instructions](#) for additional information.

TITLE & ABSTRACT: hydraulic fracturing And

AUTHOR:

Search Reset

Next >> Showing items 1 to 10 of 29

Title: [Review of Hydraulic Fracture Mapping Using Advanced Accelerometer-Based Receiver Systems](#)(68962 bytes)

Author (Publisher): Norman R. Warpinski, James E. Uhlir, Bruce P. Engler

Abstract: Hydraulic fracturing is an important tool for natural gas and oil exploitation, but its optimization has been impeded by an inability to observe how the fracture propagates and what its overall dimensions are. The few experiments in which fractures have been exposed through coring1-3 or mineback4,5 have shown that hydraulic fractures are complicated multi-stranded structures that

6

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KMD Demonstration

CD/DVD Database Search Page

7

NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

CD/DVD Database Search Results

8

NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

Section 999 Database Search Page

USA.GOV | U.S. DEPARTMENT OF ENERGY | DOE OFFICE OF FOSSIL ENERGY
DOE OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY | OFFICE OF ELECTRICITY DELIVERY & ENERGY RELIABILITY
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9

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KMD Demonstration

Section 999 Database Search Results

Results 1 - 10 of about 15 for **treatment of produced water** (site:netl.doe.gov). Search took 1.21 seconds.
[Sort by date](#) / Sort by relevance

10

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KMD Demonstration

Design

- **The site will include GIS and Data Visualization (e.g. Xcelsius) in the near future**
 - Currently working through NETL IT Security Policy Analysis for deployment
 - Utilize readily available GIS shapefiles from USGS, MMS, EIA, EPCA Phase III study and others
 - Three web map services are complete or will be complete in the near future:
 1. Gulf of Mexico Deepwater
 2. KMD – Oil and Gas Resources of the United States
 3. Allegheny National Forest
- **Future emphasis will focus on development of value-added products and incorporate commercial data from Ventyx (Velocity Suite), ARI (Big Oil Field Database), Nehring Associates (Significant Oil and Gas Fields of the United States Database), and others**
 - Continue to add documents and links to the Document Database (5,000+ additional NETL Library hard-copy reports, ~5,000 LPO microfiche, etc.)
 - Additional Web map services and Xcelsius dashboards
 - Potential incorporation of MS Silverlight

KMD Demonstration

Content Search Tools

- **CD/DVD Database 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**
 - ProMIS technical/topical reports
 - Key publications from the CD/DVD library
 - Key publications from the OSTI database
 - Key publications from the Tulsa Office (LPO documents in near future)
 - Additional documents from the NETL Morgantown library: 397 final reports in PDF format and references to 5,000+ additional hard-copy reports

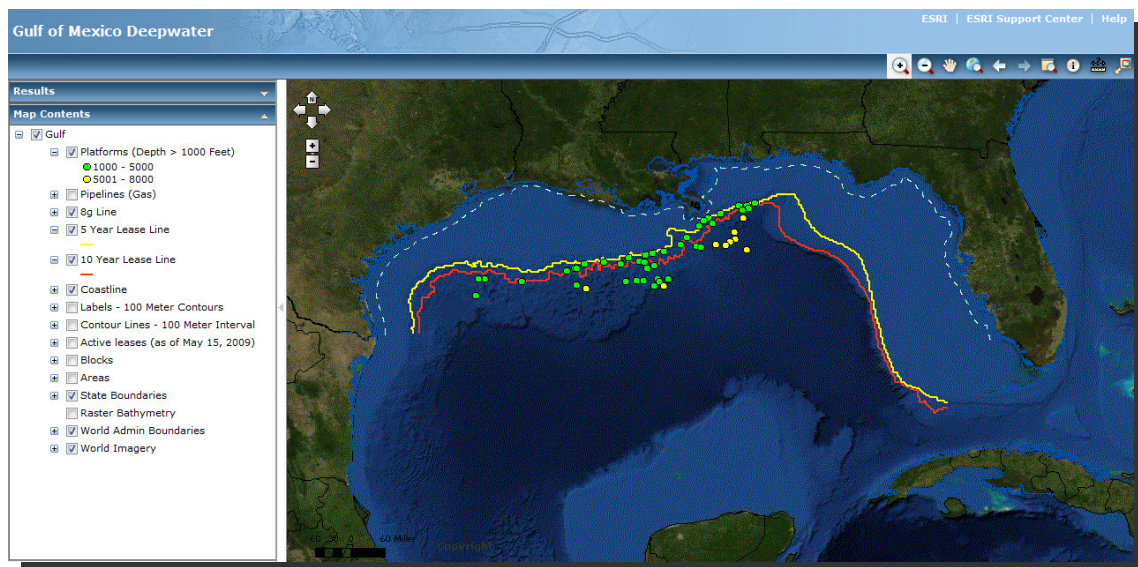
KMD Demonstration

Web Map Services

- **ArcGIS Web Map Services to allow 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**
 - 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

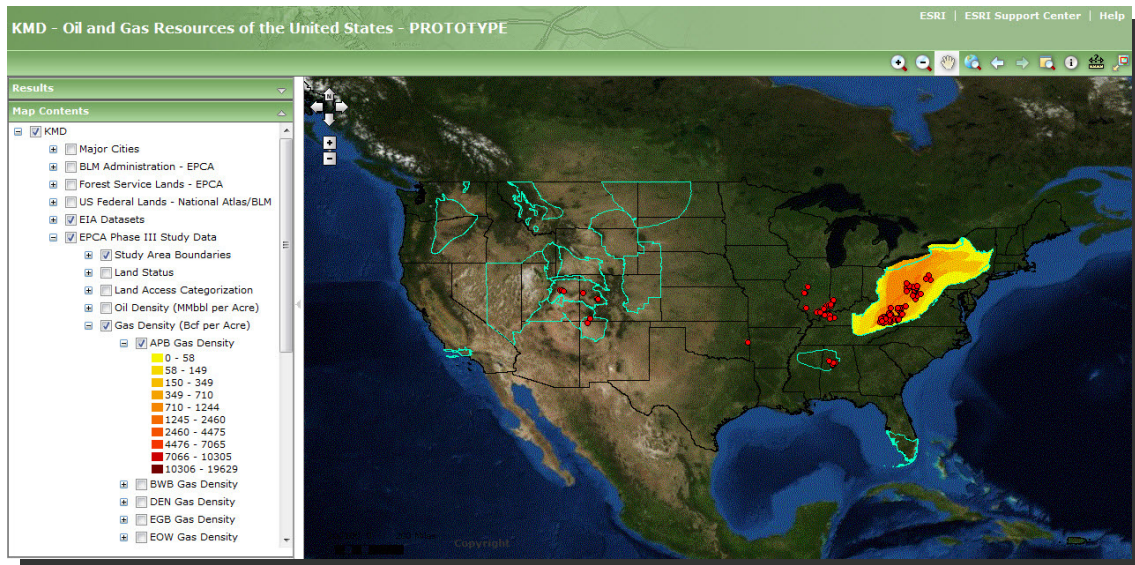
KMD Demonstration

Gulf of Mexico Deepwater Prototype



KMD Demonstration

Oil and Gas Resources of the United States Prototype



15

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KMD Demonstration


Other Visualizations

- **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

16

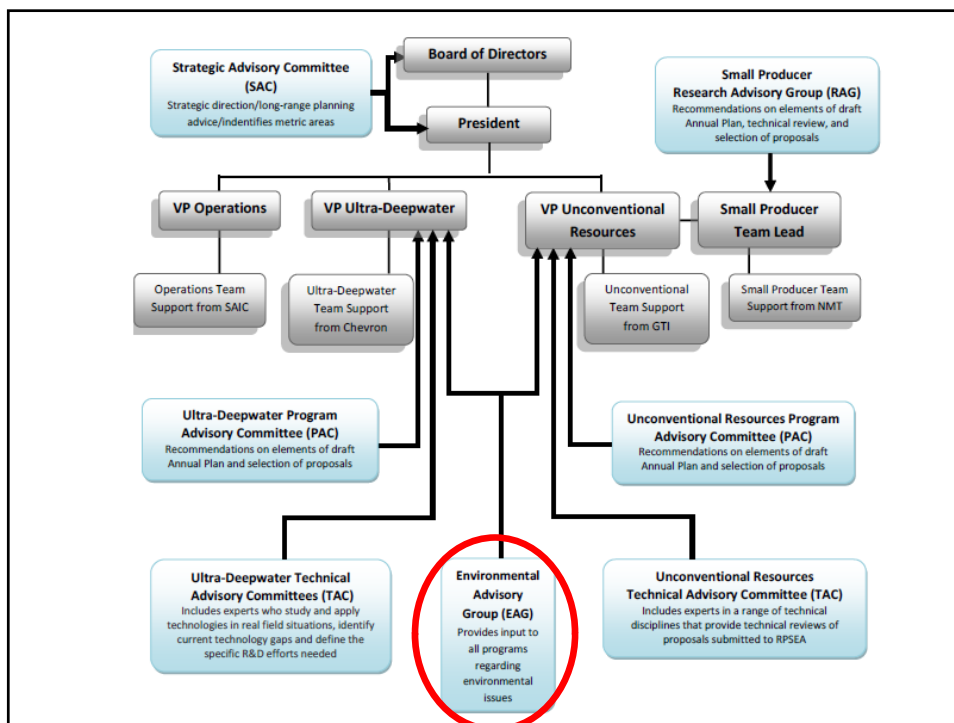
NATIONAL ENERGY TECHNOLOGY LABORATORY

Attachment 7



Environmental Advisory Group

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Environmental Advisory Group (EAG)

Environmental stewardship is at the core of all RPSEA activities.

The EAG is designed to provide input to the Program regarding environmental issues.

- Organizes and brings together key experts and policy leaders from academia, regulatory entities, nongovernmental organizations, and industry for road mapping exercises to identify key regulatory barriers/issues.
- As requested, the EAG reviews programs, projects, and plans to ensure that environmental issues are appropriately addressed.
- Serves in a liaison capacity with various environmental programs and organizations.



Environmental Issues are Imbedded in the RPSEA Activities (examples)

- **RPSEA Member Forums**
 - Technology for Mitigation of Environmental Impact of Rocky Mountain Unconventional O&G Operations Forum (5/12/08)
 - Low Impact O&G Operations in Environmentally Sensitive Areas Forum (5/30/08)
 - Long-Term Environmental Vision for Ultra-Deepwater Exploration and Production (11/20/08)
- **Industry Functions**
 - Barnett Shale Produced Water Conference 2007
 - Center for International Energy and Environmental Policy 2009
 - Clean Technology Conference and Expo 2009
 - Energy and Environment Subcommittee Meeting 2008
 - Interstate Oil and Gas Compact Commission Annual Meetings and Mid-Year Summits 2007, 2008, 2009

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**Research
Partnership to
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for America**

**Review of
Complementary
Environmental
Research**


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Environmental Protection Agency (EPA)

- Strategic multi-year planning process to guide the direction of its research over five or more years.
- Enables EPA's Office of Research and Development (ORD) to focus on the highest priority needs for science and promotes coordination of research across its laboratories and centers to achieve research goals.
- ORD's research program is planned in collaboration with EPA's program and regional offices, and is described in Multi-Year Plans (MYPs).
- Programs include *Clean Air, Drinking Water, Ecosystem Services, Endocrine Disruptors, Global Change, Land, and Water Quality.*

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Department of Defense (DoD)

- DoD's Strategic Environmental Research and Develop Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) are designed to help the DoD fulfill its mission in an environmentally sound manner.
- Combine a more research focused arm (SERDP) with a technology development arm (ESTCP).
- Example funding areas include:
 - *Remediation of Contaminated Groundwater*
 - *In Situ Management of Contaminated Sediments*
 - Characterization, Control, and Treatment of Range Contamination
 - Military Munitions Detection, Discrimination, and Remediation
 - Energy Efficiency and Renewable Energy for DoD Installations.

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Department of Interior

- Many different programs going on across the country that could assist RPSEA funded researchers in understanding how the environment may be impacted by the technology that they are developing.
- Research areas include *aquatic ecology, ecosystem modeling* and *landscape ecology*.
- The *Environmental Applications and Research Group* conduct impact assessment studies associated with Reclamation's and other Federal agencies' compliance requirements under the National Environmental Policy Act, Endangered Species Act, Clean Water Act, and other legislation.
- The *Riparian and Wetland research program* located at Reclamation's Technical Service Center in Denver, CO, combines numerous scientific and engineering disciplines to help understand and manage natural riparian and wetland ecosystems.

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Minerals Management Service (MMS) Department of Interior

- MMS has a substantial amount of funded research that RPSEA funded deepwater researchers should be made aware of.
- A specific goal of the MMS Environmental Program is to develop workable solutions for those industry activities that could adversely affect environmental resources.
- Environmental science research, funded by the MMS, *provides technical information to elucidate complex environmental processes and provides analyses for NEPA (National Environmental Policy Act) and OCSLA (Outer Continental Shelf Lands Act) reports, and proposed legislation and regulations that may affect OCS activities.*

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Research Funded by Foundations, Others

- *Gordon and Betty Moore Foundation* awarded a two-year, \$1.97 million grant to a collaboration of *Stanford University's Woods Institute for the Environment, The Nature Conservancy* and the *World Wildlife Fund* to develop a software program for *mapping and evaluating the economic benefits provided by temperate marine ecosystems*.
 - Proposed software will give policy makers and other stakeholders a means to calculate the services that people derive from ocean ecosystems and to incorporate those values into planning processes.
- In 2005, the *World Wildlife Fund – Canada and Environment Canada* helped to fund research projects concerning the sage grouse.
- Other research has been funded by Ultra, Wyoming Game and Fish, the Bureau of Land Management (BLM), Shell and EnCana.
- Other wildlife research in Wyoming's Upper Green River Valley has also been funded by industry, Wyoming state government and Federal agencies.

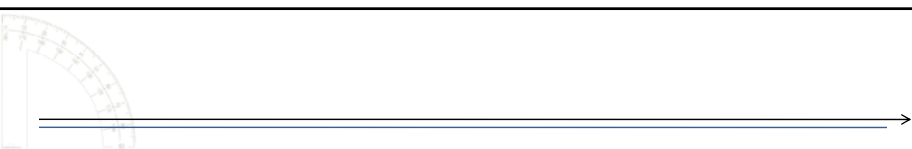
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Research Funded by Texas Environmental Research Consortium (TERC)

- TERC (www.tercairquality.org) receives funding from Federal, state and private sources to *improve ozone science and air quality modeling*.
- Manages a program to develop and verify technologies that reduce nitrogen oxide (NOx) emissions from diesel engines.
- Manages programs related to emissions inventories, monitoring, atmospheric chemistry, meteorology, complex air quality modeling, human exposure and policy analysis.

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RPSEA Program

- **Research
Partnership to
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for America**

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RPSEA 2010 DAP

Longer Term (UDW)

- **Objective 5: Environmental and Safety Technology Development and Deployment**
 - The UDW will assess the environmental and safety impact of UDW-funded projects.
 - This effort may take the form of individual solicitations or elements of more extensive project-based solicitations.

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UDW Program

Need 6: HS&E Concerns (Safety and Environmental)

- **Initiative 1: Metocean Needs That Impact Operations and Facility Design**
 - **Effect of Global Warming on Hurricane Activity (2007)**
National Center for Atmospheric Research (NCAR)
 - The primary objective is to assess the threat that global warming will substantially increase GOM hurricane activity (intensity and/or frequency).
 - Assessment is to be based on simulations using a high resolution climate model capable of generating hurricanes without data assimilation.
 - **Gulf Three Dimensional Operational Current Model Pilot (2008)**
 - Overarching goal of this pilot is to improve the ability of numerical models to forecast the loop current and its associated eddies.
 - Vision of success at the end of the pilot is that there will be a well-validated operational model (or perhaps ensembles from multiple models) in place that produces timely, accurate forecasts, which are summarized by web-based products that provide substantial benefits to knowledgeable users.

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2009 UDW

Initiative 2: HS&E Concerns with Emerging New Technologies

- **Subsea Processing and Seabed Discharge of Produced Water**
 - Proposals addressing review and evaluation of existing regulations, standards and HS&E requirements that may govern deepwater surface and/or seabed direct discharge of produced water, define relative seabed conditions, environment, and marine toxicology will be of interest.
 - Cost/benefit/impact assessments and conceptual design(s) of subsea processing systems(s) that incorporate discharge of solids and produced water at the seafloor and proposals on other related topics will also be requested.

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2010 UDW

Need 6: Associated Safety and Environmental Concerns

- Tremendous amount of environmental research funded by the federal and state governments as well as private foundations.
- RPSEA will reach out to the environmental researchers and safety professionals, enabling them to understand the importance of their efforts with respect to U.S. domestic energy production.
- RPSEA's focus is on technology development and, as such, RPSEA will be focusing efforts to ensure new technology developed within the program takes environmental impact and safety considerations into account.
- RPSEA will be seeking to leverage ongoing research efforts, and collaborate within existing forums and venues, and where possible integrate with ongoing UDW projects.
- Areas of study may include:
 - Discharge of produced water subsea – technology and regulatory aspects
 - Environmental impacts associated with technologies addressed under other UDW needs

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Unconventional Environmental Focus

- Develop advanced drilling, completion and/or stimulation methods that allow a greater volume of reservoir to be accessed from a single surface location
- Develop advanced drilling approaches that minimize the surface impact of well construction associated with the targeted unconventional gas resource
- Develop advanced completion, stimulation and/or reservoir management approaches that minimize the environmental impact associated with the development of the targeted resource
- Develop methods for planning and site selection that minimize the surface footprint and the impact of drilling and production operations
- Develop surface mitigation methods applicable to all environments
- Develop technologies to recycle water
- Develop technologies for detection and capture of emissions from unconventional oil and gas operations

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Environmentally Friendly Drilling Program

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

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

From the past...
(2003/04 - 2007/08)

As the present drill site pad 4 times smaller and able to access multiple wells (from RPSEA innovation)

System includes:

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

SPONSORS

ENVIRONMENTAL ORGANIZATIONS

ALLIANCE MEMBERS

MANAGEMENT TEAM

Deepsea Hybrid Power Systems

*Houston Advanced Research Center
Lawrence Livermore National Laboratory
Naval Facilities Engineering Service Center
Yardley Technical Products
Curtis-Wright Corporation
Shell
Chevron*

EVALUATE ALTERNATIVE METHODS FOR LOCALLY GENERATING SIGNIFICANT ELECTRICAL POWER ON THE SEAFLOOR

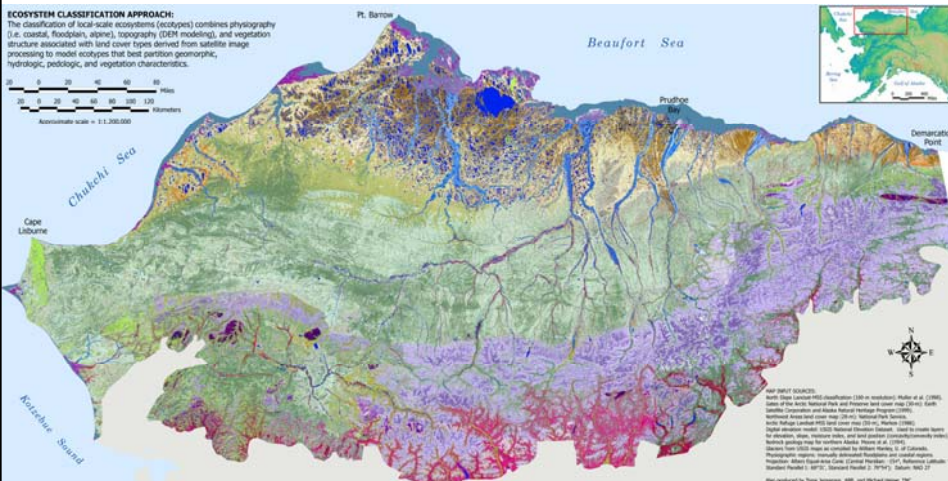
- Document the performance and functional requirements expected for subsea hybrid power systems. (Basis of Design Document)
- Using the existing knowledge base of high-performance energy conversion and storage systems, appropriate for underwater applications, and as the basis for several conceptual designs, systematically screen and develop a data base for the best hybrid power system.
- Select the two most promising generation-storage combinations, and prepare detailed sub-scale conceptual prototype design(s), and perform initial qualification testing for the purpose of concept demonstration.
- Perform a formal Risk Assessment of the two conceptual prototype system(s) and document their respective Technology Readiness Levels (TRLs). Further, estimate the environmental impact (carbon footprint) of such systems were they deployed and then compared to conventional gas turbine power generation.

Scenario	Energy Density	Storage	Power	Efficiency	TRL	Notes
First scenario with energy produced at point of use with proton exchange membrane (PEM) fuel cell, with hydrogen fuel and oxidant ferried from surface.	~100 Wh/kg	~100 Wh/kg	~100 W	~40%	~3	...
Second scenario with energy produced at point of use with small commercial PWR, with bank of lithium ion batteries used for energy storage.	~100 Wh/kg	~100 Wh/kg	~100 W	~40%	~3	...
Third scenario with energy produced at point of use with small commercial PWR, with bank of lithium ion batteries used for energy storage.	~100 Wh/kg	~100 Wh/kg	~100 W	~40%	~3	...

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Ecosystem and Biodiversity Measurement and Assessment

Develop tools for adaptive ecosystem management to assist integrated management of land, water and living resources that promotes conservation and sustainable use.



2020 Vision

Network of Self-Sustaining Regional Centers

- Remote sensing
- Modeling
- Risk management assistance



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

**Environmental
Advisory Group
Thoughts and
Recommendations**


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RPSEA's Focus – Technology Development

- Researchers funded by RPSEA need to ensure that they understand environmental issues in order to determine how the technology that they are developing can affect the environment.
- There are tremendous opportunities for RPSEA to *leverage ongoing environmental research efforts*.
- RPSEA's program may be complemented by environmental research funded by others.
- Technology developers and environmental scientists need opportunities to interact and challenge one another.
 - In this way, multidisciplinary teams may form and environmentally focused technology development projects may arise.

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EAG Recommendations

- RPSEA should be *pro-active in fostering interactions between RPSEA-funded technology development and environmental research funded by others.*
 - Have RPSEA-funded UDW researchers attend and participate in the MMS Information Transfer Meetings (ITM's) that are held on a two-year cycle (odd years).
 - RPSEA could hold a specific session of the ITM wherein RPSEA-funded research is presented.
 - Enables RPSEA-funded research to be reviewed by environmental scientists.
 - Organize a Deepwater Information Transfer Meeting that is held on a two-year cycle (even years).
 - Environmental scientists that typically attend the MMS ITM's should be invited to participate.
 - Having a yearly exchange will enable RPSEA researchers to network with environmental scientists and could lead to multidisciplinary research teams.
 - Organize an Onshore Information Transfer Meeting that is held on a two-year cycle (odd years).
 - Environmental scientists funded by state and Federal agencies as well as foundations and other sources should be invited to participate. Having such an exchange will enable RPSEA researchers and environmental scientists to network and could lead to multidisciplinary research teams.
 - Objective of the meeting would be to present ongoing research in order to identify environmental issues.

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EAG Recommendations (continued)

- *RPSEA proposal review/selection process* and should attend project selection meetings.
- Consider weighting factors for multidisciplinary teams for review criteria.
- After the Information Transfer Meetings have been established and progress is made towards forming multidisciplinary teams, *RPSEA should hold an Environmental Forum to solicit program ideas* related to RPSEA's mandate.

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Questions?



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Attachment 8



Status Update
EPAct 2005 Title IX, Subtitle J Section 999 A(b)(4)
NETL's Complementary Research Program
September 2009

George Guthrie, Focus Area Leader
Geological & Environmental Systems
Office of Research and Development

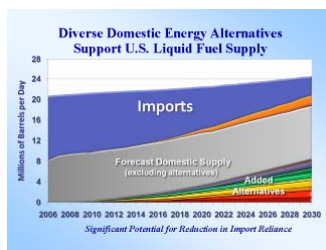


**Complementary Program consists of research
conducted by NETL's ORD and OSAP.**

**Office of Research
& Development**



**Office of Systems,
Analysis, & Planning**



**Extramural Research
and Collaboration**



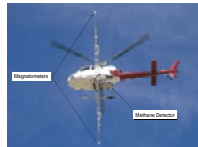
- **Annual Merit Review** (this year held on 15–16 July 2009)
 - External panel review of scientific and technical quality of projects
- **Annual Technical Committee Review** (this year held on 6 August 2009)
 - Annually assesses complementary and non-duplicative nature
- **Institute for Advanced Energy Solutions (IAES)**
 - NETL institute that engages university community for joint R&D

Geological/Environmental Research Areas

Science/engineering research of natural systems to enable the clean production & utilization of fossil energy

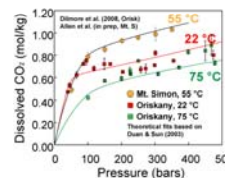
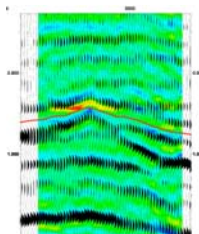
CO₂ Storage

- Capacity, injectivity, long-term fate
- Seal integrity (cement durability)
- Potential impacts (fluid-rock interactions)
- Monitoring and assessment (including GIS, risk assessment)



Oil, gas, unconventional fossil fuels

- > Extreme drilling (deep & ultra-deep)
- > Environmental impacts
- > Unconventional oil & gas (including EOR)
- > Resource assessment (geospatial data)
- Methane hydrates



Main Competencies

- Drilling under extreme conditions
- Multiscale/multiphase fluid flow (including fractured media)
- Geomaterials science
- Field-based monitoring
- Geospatial data management/assessment

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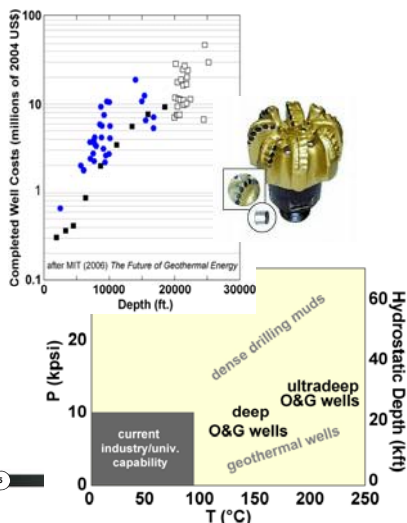
		Ultra-Deepwater	Unconventional Gas			Unconventional Oil (oil shale, oil sands, heavy oil)	Mature Fields (operated by small producers)
			CBM	Tight Gas Sands	Gas Shales		
Resource Development	Water Mgmt.	NA	1 project (2007)		2 Projects (2008)		
	Reduce Costs	15 Projects (2007) 9 Projects (2008)					2 projects (2007) 1 project (2008)
	Increase Recovery		5 projects (2007), 1 project 2008			Microwave heating Fractured media models Oil shale catalysts	CO ₂ EOR
	Resource Character.	Subsalt Seismic Modeling (2007)		2 projects (2007) 2 project (2008)	6 projects (2007) 2 project (2008)	5 projects (2007) 3 project (2008)	Marcellus Resource Assessment
HPHT Resources	Drilling	Extreme Drilling Laboratory					
		HPHT Materials					
	Modeling	EOS for HPHT	NA	NA	NA	NA	NA
Environmental Impact Assessment and Mitigation	Surface	NA	Ecological Impact of Oil and Gas Activities (EIOG)			Environmental Impacts of Unconventional Fossil Fuel Development (Oil Shale)	EIOG
	Air		Environmentally Friendly Drilling (2008)				Low Impact Roads (2007)
	Water		Monitoring/Modeling Air Emissions from Oil and Gas E&P Activities				
Technology Transfer		Produced Water Management					
		Knowledge Management Database (KMD) and RPSEA 2.5% Tech. Transfer				KMD/RPSEA Oil shale archive	KMD/RPSEA

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4

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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★ More detail to follow

Environmental Impacts of Oil/Gas

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



Major Elements to Research Focus

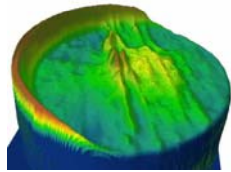
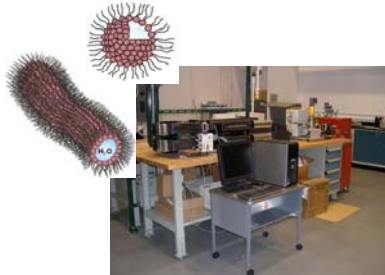
- Evaluation of strategies for effective and environmentally sound disposition of produced waters
 - Produced water database (PWWIS)
 - Evaluation of potential options (subsurface drip irrigation; ephemeral streams) ★
 - Quantitative models via a portfolio of monitoring options (airborne, UAV, hyperspectral, electromagnetic, LIDAR, etc.)
- More accurate assessment of air-quality impacts by detailed measurement and improved computational representations
- (Fundamental inorganic and organic geochemistry of reservoir fluids—including natural background vs. production)

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★ More detail to follow

Unconventional Oil & Enhanced Oil Recovery

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



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
- 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
- (EOS for CO₂-brine-hydrocarbon at elevated PT) ★

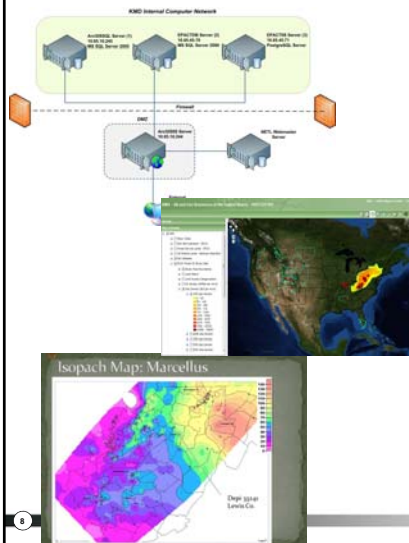
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★ More detail to follow

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

8

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Drilling under Extreme Conditions

Goal

- To elucidate drilling dynamics under high PT (up to 250 °C, 30 k psi)

Challenges

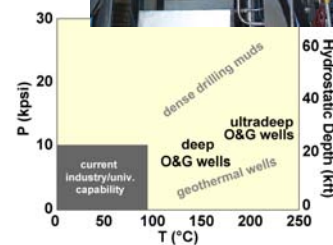
- Drilling costs increase exponentially with depth
- Observation of drilling dynamics limited (experimentally challenging)

Project Objectives

- State-of-art facility
 - Designed with industry input
 - Dramatic expansion of PT envelope
 - X-ray imaging
 - Rock/mud labs
- Single cutter with potential for full bit
- Data for model validation
- Collaborative R&D on drilling dynamics
 - Flexibility to work with others

Key Collaborators

- Schlumberger, Baker Hughes, & ARMA
- U. Utah, CMU, Pitt, WVU, LSU



9

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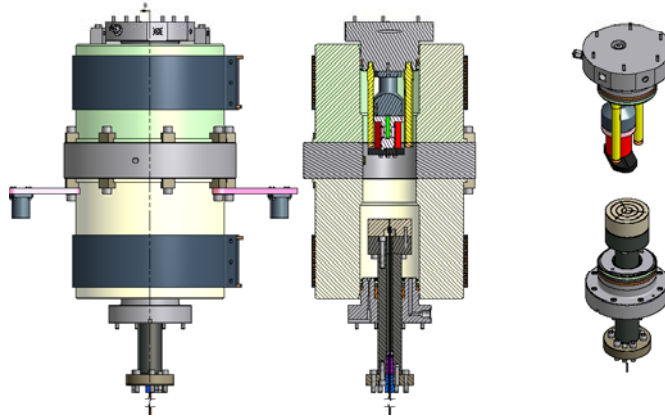
Ultra-deep Drilling Simulator



10

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Ultra-deep Drilling Simulator



11

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Calendar Year 2009 Objectives

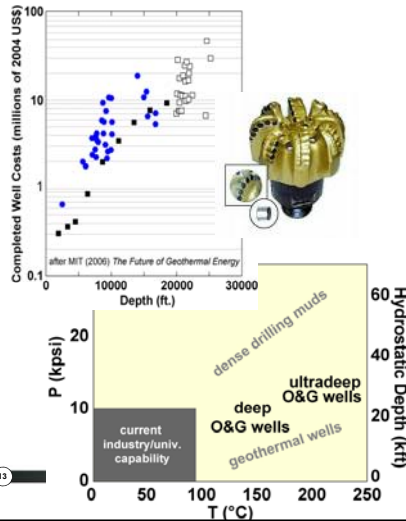
- **Proof test pressure vessel at TerraTek**
(Completed instead at NETL in March 2009)
- **Ensure full functionality of UDS at NETL**
(Underway and expected to be completed by September 2009)
 - Perform series of functionality and shakedown testing
 - Install and shakedown x-ray system
- **Conduct baseline testing**
(Preparations underway. Objective expected to be completed by December 2009)
 - Validate single-cutter approach with multi-cutter results
 - Extend full bit simulations to elevated T and P
 - Initiate testing of various drilling muds/fluids using model rock systems
- **Establish Industry Working Group**
(Underway. Initial visit to NETL FY10 Q1/Q2)
 - Generate industry commitment to the XDL
 - Input to future test plans
 - Ensure research meets current industry needs and fills technology gaps

12

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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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★ More detail to follow

Nanotechnology for HTHP Drilling Applications

NETL: Phuoc Tran, Yee Soong

IAES: Minking Chyu, Jung-Kun Lee (Pitt)

Rakesh K. Gupta, Sushant Agarwal (WVU)

Lynn M. Walker, Dennis C. Prieve (CMU)

Goal

- To improve the economic viability of drilling for domestic deep and ultra-deep oil and natural gas (under high PT—up to 600 °F, 40 k psi)

Challenges

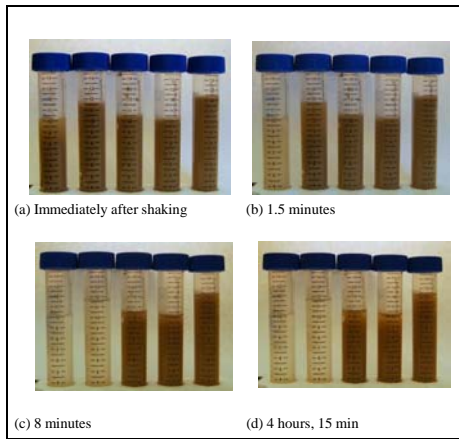
- Currently, polymeric additives are used but they degrade quickly at HTHP
- Use of nanoparticles for this application is a new concept, but mechanisms and controlling factors are not known

Project Objectives

- Using nanofluids and nanoparticles to tailor transport properties of drilling fluids for oil and gas drilling under HTHP conditions
- Two approaches under investigation:
 - Nanofluids with commercially available nanoparticles (impact on rheological, thermal, thixotropic properties & stability; haloing)
 - Design of new nanoparticles: Cation-exchanged laponite nanoparticles; bentonite-Fe-oxide nanohybrids

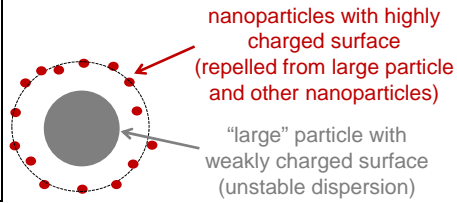
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Nanoparticle addition can stabilize barite suspensions.



Proposed mechanism:
"Nanoparticle haloing"*

* Tohver et al. (2001) Proc Natl Acad Sci **98**:8950

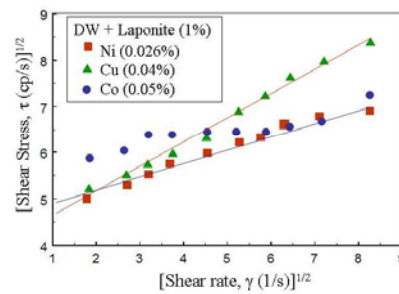
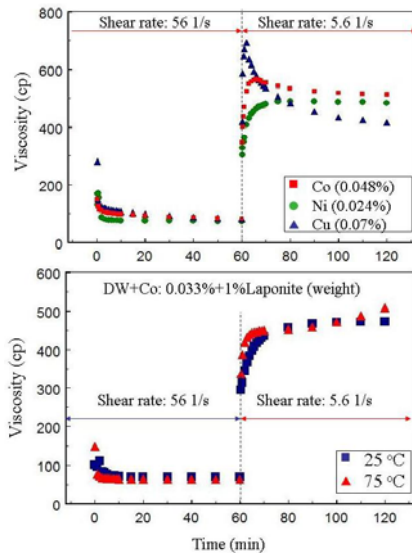


Settling of barite suspensions as a function of time in (from left to right) deionized water, NaOH solution, three different concentrations of silica nanoparticles

15

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Nanofluids Containing Cation(metal)-exchanged Laponite Nanohybrids (Prepared via Laser Ablation)

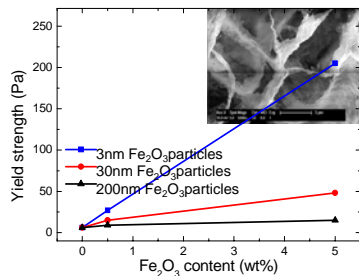
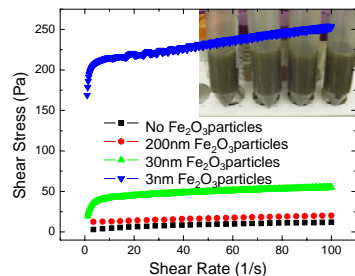


- Fast gel break down and build up
- High gel strength for suspending weighting materials
> 2.2 N/m² & 1.7 N/m² for Ni- & Cu-laponite (barite suspension requires ~0.5 N/m²)

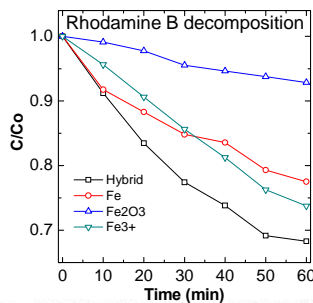
16

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Hybrid nanoparticle mixtures could lead to tunability.



- Create **smart drilling fluids** with high temperature stability and tunable viscosity by adding Fe_2O_3 nanoparticles into clay based fluids.
- Find the **correlation** among **particle size** and **viscosity** in the fluids consisting of Fe_2O_3 nanoparticles and clays.



17

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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 (PWWIS)
 - 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
- (Fundamental inorganic and organic geochemistry of reservoir fluids—including natural background vs. production)

18

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★ More detail to follow

Novel Uses for Produced Waters

Subsurface Drip Irrigation

Goal

- To develop environmental science base for assessing novel approaches to produced waters, including use of CBNG water in subsurface drip irrigation (SDI)

Challenges

- High sodium content impacts soil structure and chemistry

Key NETL Capabilities and Facilities

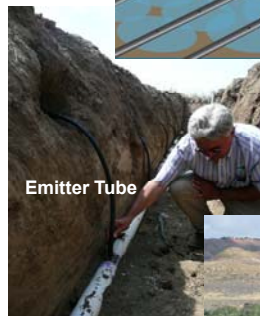
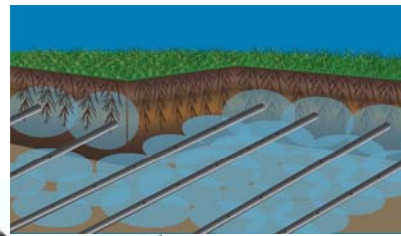
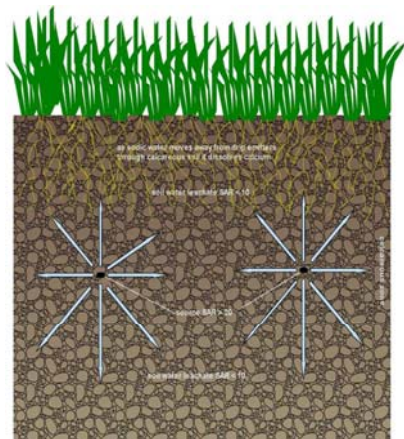
- Airborne and ground-based electromagnetic surveying, hydrology, and geochemistry

Key Collaborations

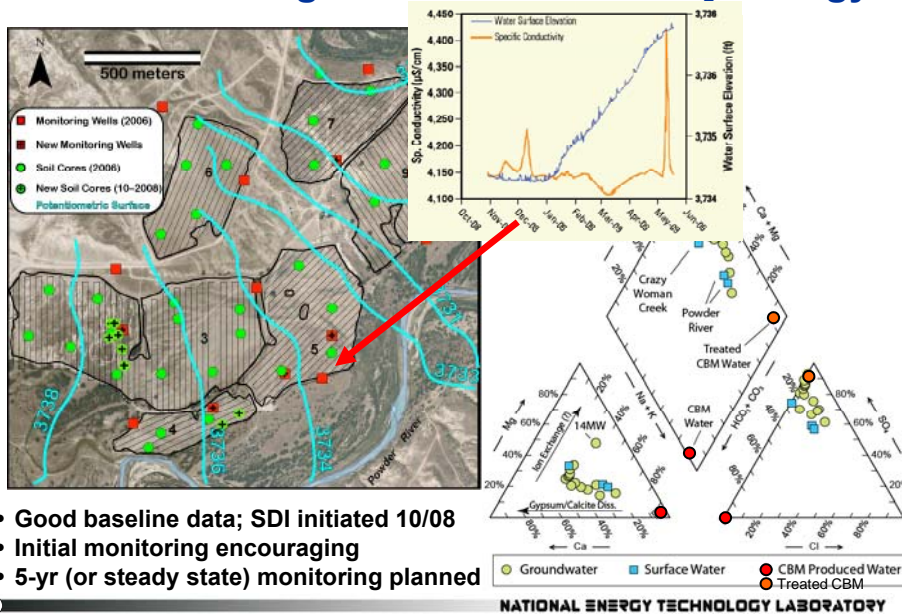
- USGS
- BeneTerra LLC (CRADA partner, agronomy, soil science)
- Wyoming DEQ
- Anadarko (CRADA partner, funding and site access)



Subsurface Drip Irrigation-Installation



SDI Monitoring and Groundwater Hydrology

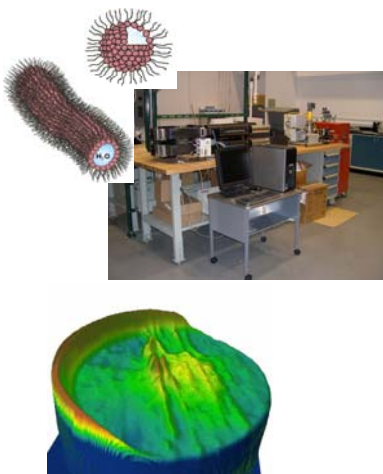


- Good baseline data; SDI initiated 10/08
- Initial monitoring encouraging
- 5-yr (or steady state) monitoring planned

21

Unconventional Oil & Enhanced Oil Recovery

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



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
- 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
- (EOS for CO₂-brine-hydrocarbon at elevated PT) ★

22

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★ More detail to follow

Control of CO₂ Viscosity for EOR

NETL: Yee Soong

IAES: Bob Enick (Pitt) (J. Eastoe, U. Bristol; design/synthesis of CO₂ thickeners)

Goal

- To reduce the mobility of CO₂ in porous media by adding a CO₂-soluble surfactant that either (a) thickens CO₂ or (b) forms CO₂-in-brine foams

Challenges

- Low viscosity of CO₂ inhibits efficient sweep of reservoir
- Difficult to dissolve surfactants in CO₂ at MMP because they must contain CO₂-phobic segments and CO₂ is a feeble solvent
- Even more difficult to tailor the surfactant either to form rodlike micelles or to stabilize CO₂-in-brine emulsions

Project Objectives

- To identify inexpensive, environmentally benign, CO₂-soluble surfactants that are capable of lowering the mobility of CO₂ in cores
- FY09: To identify surfactants that demonstrate proof-of-principle

State of Science

- No other group is working on direct thickeners for CO₂
- DOW has a new proprietary CO₂ foam-forming surfactant ^(1,2)

(1) Le, Nguyen, Sanders, SPE 113370, 2008 SPE/DOE IOR Symp.; Tulsa, OK; April 2008

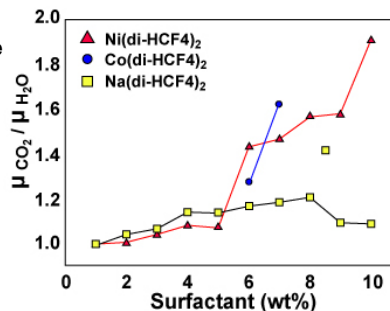
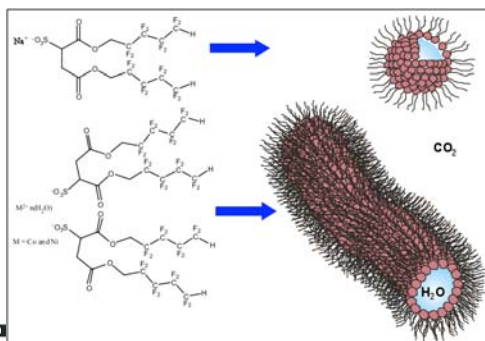
(2) Dhanuka, Dickson, Ryoo, Johnston; J. of Colloid and Interf. Sc.; 298 (2006) 406-418

23

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Accomplishments

- Demonstrated that viscosity-enhancing rodlike micelles can be formed in CO₂
 - Now trying to design an affordable, non-fluorous surfactant that can do so in dilute concentration at MMP
- Identified two commercially available, CO₂-soluble, very water-soluble, nonionic surfactants (DOW Tergitol NP9, BASF Lutensol XP70) and demonstrated that they can stabilize CO₂-in-brine emulsions (data not shown)



SANS data verify that micellar shape for Ni- and Co-(di-HCF₄)₂ is rodlike, whereas Na-(di-HCF₄) forms spherical micelles.

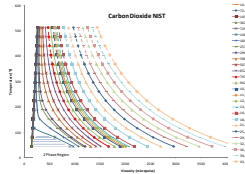
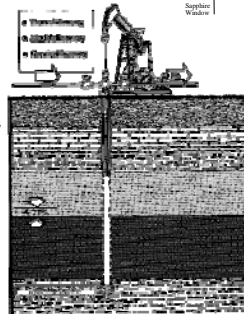
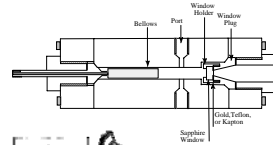
24

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Equation-of-State Modeling for Extreme Geological Conditions



- Combine PVT and PVT μ literature data with a focused experimental program to create a comprehensive database that is required to develop PVT-EOS
 - 500°F, 40kpsi
 - Phase comp., number of phases, ρ , C_p , H , μ , k
- Applicable to geological sequestration as well as oil and gas production
- Improved EOS models will allow
 - Increased production
 - Increased efficiency
 - Improved safety and environmental performance



$$T = \frac{C(\lambda)F}{\mu - b(T)} - \frac{a}{\mu^2 + \alpha b\mu - \beta b^2}$$

Questions




Attachment 9

Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production




NATIONAL ENERGY TECHNOLOGY LABORATORY



Benefits Analysis, RPSEA 2007 Unconventional and Small Producer R&D Portfolio

Phil DiPietro, NETL
Director, Situational Analysis and Benefits Division, Office of Systems Analysis and Planning

Presented to the Unconventional Resources Technology Advisory Committee (URTC) at the FACA Meeting, September 16, 2009



Federal Advisory Committee Act Meetings (FACA), Unconventional Resources Technology Advisory Committee (URTAC), September 16, 2009

Presentation Outline

- **Purpose: debrief the committee on the benefits analysis that NETL has conducted for the RPSEA Unconventional Gas and Small Producer R&D Portfolios**
 - Background information
 - Methodology
 - Results
 - Peer review
 - Plans for the coming year

Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

RPSEA 2007 Unconventional Gas and Small Producer R&D Portfolio

- **26 projects**
- **36.7 MM\$ total investment**
 - 20.9 MM\$ Federal investment
 - 15.8 MM\$ industry cost share (43%)
- **Varied**
 - Technologies, target resources
 - technological maturity (white papers – field tests)
 - project size (115K – 7.5 MM\$)

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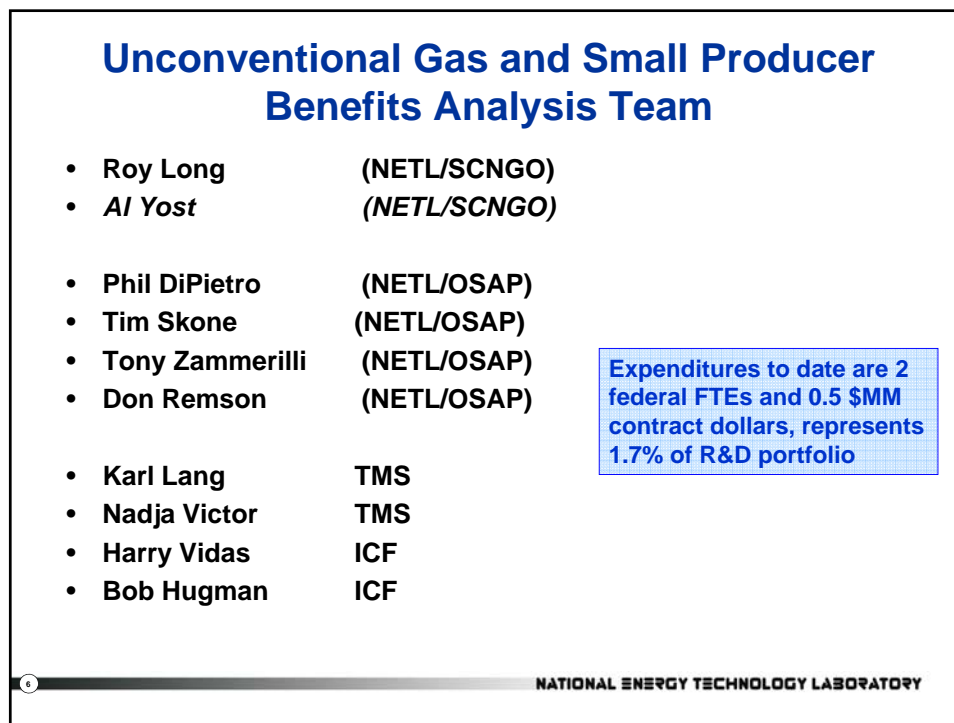
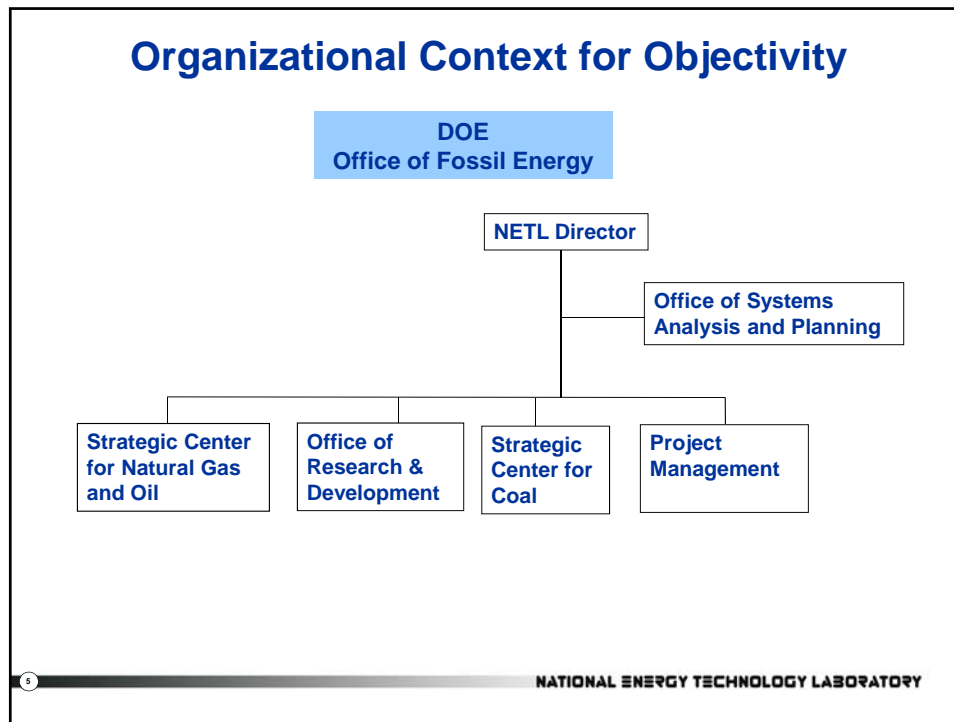
Objectives of the Benefits Analysis

- **EPA Act 999 requirement by statute**
- **Articulate the value of the research portfolio to DOE management, OMB, and stakeholders**
- **Provide NETL and RPSEA with information that can be used in portfolio management and future solicitations**

4

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production



Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Timeline of Benefits Activities

March 2008	Projects Awarded
August 2008	Benefits Analysis Methodology Selected, brief RPSEA, FE HQ
January 2009	Draft results previewed to RPSEA, FE HQ
March 2009	Peer Review Conducted
June 2009	Peer Review Report completed
September 2009	Briefing to FACA committee

7

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3-Step Analysis Methodology

- **Step 1: Evaluate each project and estimate its impact on domestic oil and gas resources**
 - 2-page business plans
 - cost and environmental benefits cast in terms of resource impacts
- **Step 2: Run all projects through a standard algorithm to develop a 30-year production profile**
 - cost competitiveness
 - capital intensity
 - market competition
- **Step 3: Aggregate project-level results and derive royalty and other benefits**

8

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Guiding Principles for the Benefits Analysis

- **Transparency**
 - embrace professional judgment
- **Technology-centered, not model-centered**
 - capture the story of each project
- **Apply an appropriate level of rigor**
 - update/expand as research progresses
- **Finite time horizon (30 years)**
 - Longer and you start counting resources that might become available without the program

9

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Step 1: Estimate Project Recoverable Resources Structure of “2-Page” Business Plan

1. **Problem Statement**
 - Description of problem and why it is important
 - Resource effected
2. **Project Scope**
 - Description of work, how it address problem
3. **Benefits Approach and Results**
 - Presentation of an analytical expression that provides the project benefit
 - Definition of variables in the analytical expression, citations, assumptions supporting numbers for each

10

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Step 2a Adjust the Project level Resource

- **Adjust the project-level recoverable resource based on project three criteria**
 - Profitability
 - Capital Intensity
 - Market Competition
- **Adjustment for each factor is a multiplier 0.2, 0.5, and 0.8 based on a low, medium, or high characterization**
- **Overall adjustment is between 1% and 50%**
 - $0.2 \times 0.2 \times 0.2 = 0.008$
 - $0.8 \times 0.8 \times 0.8 = 0.512$

11

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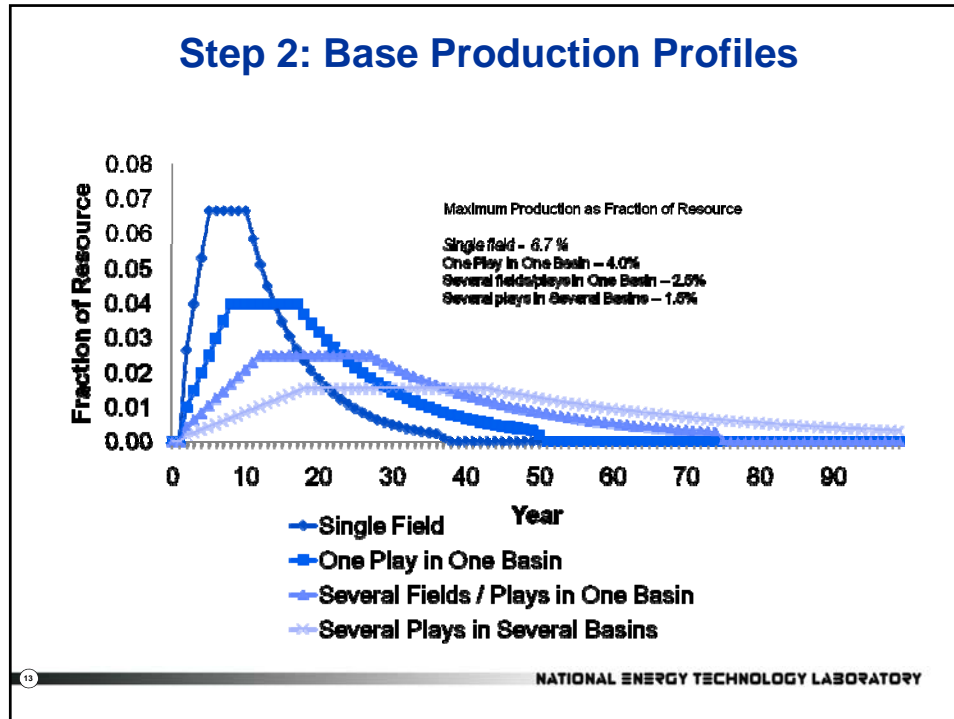
Step 2b Production Profile

- **Assign a production profile shape based on the breadth of resource to which the project applies**
 - Narrow range, steep profile with production over a short period of time
 - Broad range, slower production
- **Again applying the characterization factors for profitability, capital Intensity, and market competition adjust the shape of the profile**
 - Height of the plateau, slope of the ramp up
 - Total area under the curve stays the same

12

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production



Step 3: Aggregate into Portfolio Summary

Benefits of RPSEA FY2007 Unconventional Natural Gas and Small Producer Portfolio

Benefit	# of Projects	Funding (MM\$)*	Recoverable Resources (Step 1)	Production Through 2040 (Step 2)	Present value of anticipated Royalties, (MM\$)** (step 3)
Oil	4	3.0	3.0 Bbbl	0.12 Bbbl (4%)	62
Natural Gas	13	22.7	19.7 Tcf	1.6 Tcf (8%)	140
None at this time	9	11.0			
Total	26	36.7			203

* Numbers presented include cost share from industry. Overall the portfolio contains 43% industry cost share. Oil-producing projects have 41%, natural gas 43%, and the no benefit yet projects 42%.

** Calculated using an assumed average royalty payment of 12.5%, 35% of gas production and 12% of oil production is on federal lands, 8% discount rate, and NG and crude oil prices from the AEO 2009 reference case extrapolated

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External Peer Review

- **An external expert peer review of a benefits estimation methodology for UNG & SP Projects was held in Morgantown, WV on March 18 – 19, 2009**

Expert Review Panel

- Chuck Boyer, Schlumberger
- Lance Cole, Petroleum Technology Transfer Council
- Dave Hill, EnCana Oil & Gas (USA) Inc.
- Richard Hughes, Craft & Hawkins Department of Petroleum Engineering, Louisiana State University
- Hill Huntington, Energy Modeling Forum, Stanford University
- John Martin, New York State Energy Research and Development Authority
- Richard Nehring, NRG Associates

15

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Sample Comments from the Peer Review

- *The benefits estimation methodology presented is a solid, well-thought-out, and usable program for understanding and estimating the value of the NETL R&D program.*
- *The technology side of the benefits methodology – Very Good.*
- *I just thought the approach was reasonable and I really liked the transparency.*
- *The topic is extremely difficult. The group has embraced the objective actively. My comments focus on areas where they might improve the analysis but should not be interpreted as being negative about the significant progress that has been done to date.*

16

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Actionable Comments from Reviewers

1. **Consider using stochastic instead of deterministic methods for determining technically recoverable resource**
2. **Engage subject matter experts within the project area to provide review and input for project analysis.**
3. **Make sure risk and uncertainty is included in benefits calculation, account for the probability of success.**
4. **Re-visit the benefits methodology for jobs impacts (Input/Output model).**
5. **Improve consistency in approach used for different projects**
6. **Develop a method of capturing environmental benefits**
7. **List the exogenous risk factors which must be overcome for project to achieve its full benefit.**

17

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Summary

- **Estimated increase in domestic resource production through 2040 caused by the 2007 RPSEA R&D portfolio in Unconventional Gas and Small Producers**
 - 1.6 TCF natural gas
 - 120 million barrels of crude oil
- **Present value of estimated Federal Royalty payments**
 - 203 million dollars.
- **The portfolio has other benefits**
 - reduced cost of energy
 - improved energy security
 - increased economic growth
 - reduced impacts on the environment
- **We expect the benefits estimate to increase as the RPSEA research evolves and we are more able to gauge the benefits**

18

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Plans for Next Year

- **Conduct benefits analysis on the 2008 awards**
- **Conduct benefits analysis on the NETL complementary program**
- **Re-assess benefits for 2007 award projects based on latest results from the work**
- **Fully implement suggestions from the peer review**

19

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Thank you!

20

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Benefits Analysis Project Example

Near Miscible CO₂ Application to Improve Oil Recovery

Performers

- University of Kansas Center for Research, Inc.
- Tertiary Oil Recovery Project (TORP)
- Carmen Schmitt, Inc. (small producer)

Funding

- Total: \$342,714
- % Industry cost share: 20%
- Duration years: 2

21

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Benefits Example: Step 1

- Problem statement: Incomplete characterization of the Arbuckle is potentially holding back domestic oil production in the form of CO₂ EOR
- Scope of work
 - Perform laboratory tests on fluids and core samples, construct a compositional simulation model, and run a reservoir simulation.
 - The plan is that the simulation will indicate near miscible activity and spur a pilot scale test . . . Which would then lead to an EOR flood in the Arbuckle
- Benefits equation:
 - **Increase in Reserves = OOIP * FRAC_{CO2} * RF_{CO2}**

Where,

 - **OOIP** = Original Oil in Place in the Arbuckle
 - **FRAC_{CO2}** = Fraction of OOIP that is amenable to CO₂ flooding
 - **RF_{CO2}** = Incremental Recovery factor from a near miscible CO₂ flood
- Key assumption: Near miscible behavior is well understood, benefits do not cascade beyond the Arbuckle

22

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Benefits Example: Step 1 (cont.)

$$\text{Increase in Reserves} = \text{OOIP} * \text{FRAC}_{\text{CO}_2} * \text{RF}_{\text{CO}_2}$$

- **OOIP = 6.0 Bbbls**
 - 2.0 Bbbls ultimate recovery / 33%
- **FRAC_{CO2} = 50%**
 - Early estimate based on notion that not all of the formation will be high enough pressure
- **RF_{CO2} = 4%**
 - Confirmed value from the proposal
- **6.0 Bbbls * 50% * 4% = 120 MMbbls**

23

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Benefits Example: Step 2

- **Algorithm inputs**
 - Profitability multiplier 0.2
 - Capital intensity multiplier 0.2
 - Competition multiplier 0.8
- **Adjustment to resource estimate:**
 - 120 MMbbls * 3.2% = 3.8 MMbbls
- **Production Curve**
 - Starting year 2012 (pilot test begins)
 - Single play resource curve
 - 7 year ramp up
 - Max production rate per year is 4% of the resource
 - Algorithm inputs cause ramp up to be extended to 8.4 years and max production reduced to 3.3%
- **Production through 2040 - - 2% of initial 120 MMbbl estimate**

24

NATIONAL ENERGY TECHNOLOGY LABORATORY

Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Step 3: Deriving Royalty Impacts

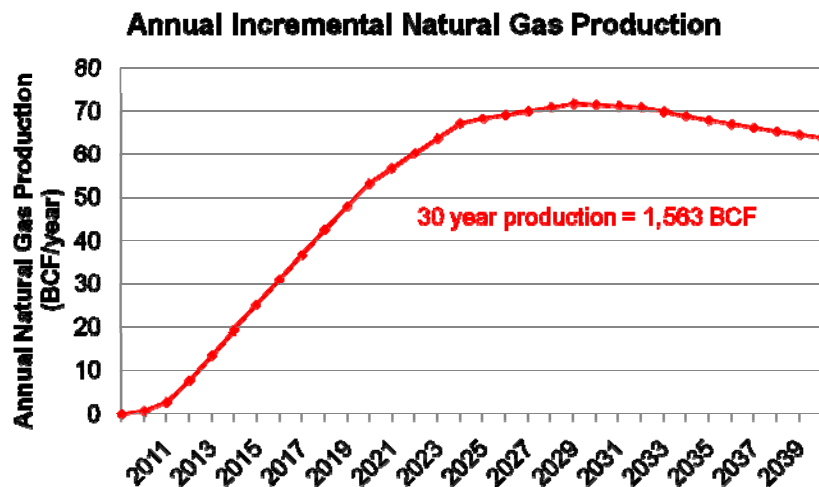
$$\text{Benefit} = \sum_{p=1}^{26} \sum_{yr=SY_p}^{2040} \text{oil}_{p,yr} \times \text{oil_price}_{p,yr} \times R_rate_{oil} \times \%_FED_{oil} \times \frac{1}{(1+\text{Discount})^{yr-2010}}$$

$$+ \sum_{p=1}^{26} \sum_{yr=SY_p}^{2040} \text{NG}_{p,yr} \times \text{NG_price}_{p,yr} \times R_rate_{NG} \times \%_FED_{NG} \times \frac{1}{(1+\text{Discount})^{yr-2010}}$$

- P =** project; yr = year
- SY_p =** start year for each project (yr production starts)
- Oil_{p,yr} =** oil production from project p during year yr
- NG_{p,yr} =** natural gas production from project p during year yr
- R_rate =** U.S. acreage royalty rate paid for crude oil, NG (12.5%)
(could have it change over time if you want)
- %_FED =** percent of oil and natural gas production that comes from federal lands (35% for natural gas, 12% for crude oil)
- Discount =** discount rate for future revenue streams (8%)

25

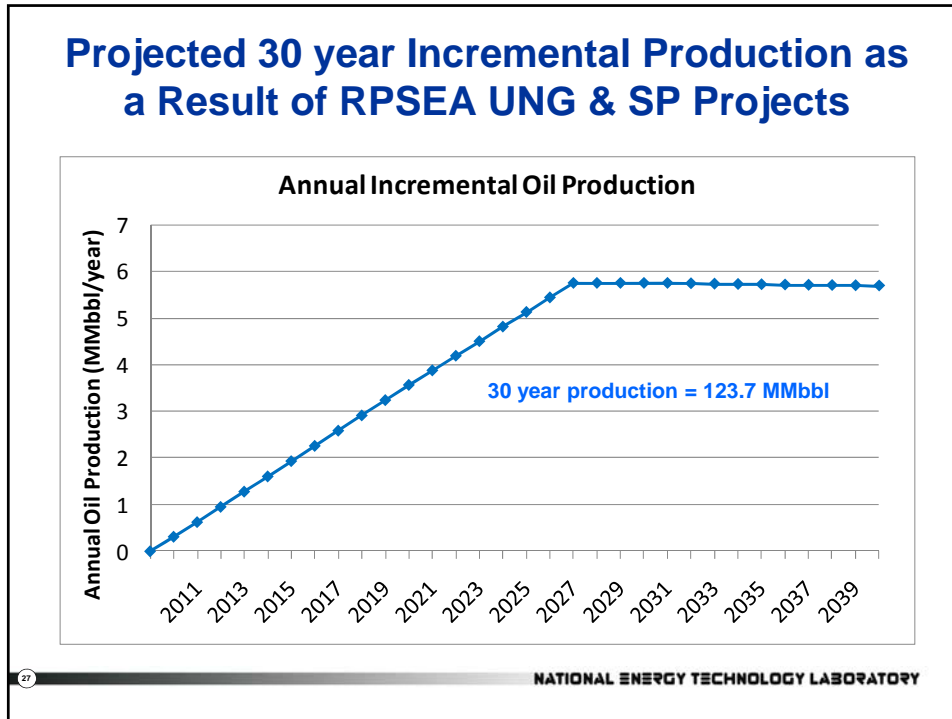
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**Projected 30 year Incremental Production as
a Result of RPSEA UNG & SP Projects**

26

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Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production



Step 1: Estimate Project Recoverable Resources

Sample information sources for constructing "2-Page" Business Plans

- **Commercial Information Sources**
 - NRG Associates – Oil and Gas Database
 - Warlick International – North American Unconventional Natural Gas Market Report
 - Hart Energy Publishing, LP – Unconventional Natural Gas Report
 - American Petroleum Institute-Joint Association Survey on Drilling Costs
 - Energy Information Agency (EIA)
- **Data from project performer in proposal**
 - Referenced sources found in proposal
- **RPSEA**
 - Project reviews
 - Regular meetings
- **NETL Experts**

28 NATIONAL ENERGY TECHNOLOGY LABORATORY

Topic 1 - Benefits Methodology including Input-Output Modeling to Capture Benefits of Incremental Production

Sample Project "2-Page" Business Plan

EPAct 999 Project Benefits Analysis Sheet	Small Producers	2008
Project Title	Near Miscible CO ₂ Application to Improve Oil Recovery	
Contract #	0712-03	
Performer(s)	University of Kansas Center for Research, Inc.: Tertiary Oil Recovery Project (TORP), Carmen Schmitt, Inc. (small producer)	
Funding Total	\$342,714	% Cost Share: 20% Duration (yrs): 2
Problem Statement		
CO ₂ flooding is not being pursued at the Arbuckle formation in Kansas, partially because the reservoir pressure is so low that the flood would behave as "immiscible" resulting in an anticipated rate of enhanced oil recovery that is not high enough to make projects economically viable. An immiscible CO ₂ flood can enhance recovery by both swelling the oil and reducing its viscosity. This mechanism has been shown to result in up to roughly half of the incremental oil per volume of CO ₂ injected as a fully miscible flood. There is potential for even greater recovery in the loosely defined "near miscible" pressure regime. A more rigorous characterization of the specific CO ₂ EOR mechanism within the Arbuckle, specifically one that takes into account potentially favorable displacement mechanisms at near miscible reservoir conditions, could show a favorable increase in the estimated amount of oil recovery and tip Arbuckle CO ₂ projects toward economic viability. This incomplete characterization of the Arbuckle is potentially holding back domestic oil production.		
Project Scope		
Two graduate students, under the guidance of a university professor, will conduct laboratory scale experiments on core and fluid samples from the Arbuckle provided by Carmen Schmitt Inc. They will measure phenomena known to indicate CO ₂ flood performance at a sequence of pressures approaching the calculated minimum miscibility pressure. They will construct a compositional simulation model based on the Peng-Robinson equation of state using previously collected PVT data and use the model to match the laboratory results. They will then conduct reservoir simulations of CO ₂ flooding in the Arbuckle and estimate enhanced oil recovery and CO ₂ storage capacity within these Arbuckle reservoirs.		
Benefits Approach and Results		
A successful laboratory modeling and testing effort could lead to a pilot scale CO ₂ injection in the Arbuckle which could lead to a commercial-scale flood.		
The maximum potential benefits of this project may be stated as incremental reserves and calculated using the following simple equation. These benefits assume successful laboratory studies followed by successful pilot projects involving Arbuckle reservoirs followed by large scale commercial flooding.		
$\text{Incremental reserves} = \text{OOIP} * \text{near miscible recovery factor} * \text{fraction of Arbuckle amenable to CO}_2 \text{ flood}$		
Where:		
OOIP = The Arbuckle's OOIP can be estimated at roughly 6.0 billion barrels, of which 33		

* has been recovered to date via primary recovery and water flood. Carmen Schmitt operates in 5 Arbuckle reservoirs estimated to contain an OOIP of \$59 million barrels.

Near miscible incremental recovery factor - (3-5% was referenced in the proposal and can be supported by immiscible floods discussed in the literature)

Fraction of Arbuckle OOIP amenable to CO₂ flood - Unknown, data not available to assess this number. Will assume 100% to generate maximum potential.

The estimated 3-5% recovery factor for near miscible CO₂ flooding can be supported by case studies from the literature:

- An immiscible flood in the Avile reservoir was estimated to recover 4% of OOIP.¹
- A series of four immiscible projects in Trinidad were estimated to have incremental recoveries ranging from 2 to 8% of OOIP.²
- An assessment of North Dakota CO₂ flooding potential noted that 8% is a widely used empirical value for miscible flooding in West Texas carbonates and that immiscible CO₂ floods generally recover 50% or less of what is recovered in miscible floods.³

Evaluation of the specified benefits equation gives a maximum potential of 180 to 300 million barrels of oil as a result of CO₂ flooding in the Arbuckle. Research will need to proceed to pilot test level before realistic estimates can be made. At this early stage, benefits will be estimated assuming only Carmen Schmitt operated fields. This assumption applied to the equation gives an estimate of 34 million barrels. The research indicates that the potential for near-miscible behavior in borderline formations is well understood within the oil and gas industry. As such, it is unlikely that this work will cause incremental domestic oil production beyond the Arbuckle.

References	
Bouch, R.M., Davitt, H.J., Amos, O.B., Arguilla, I., Whiteside, J.M., "Immiscible CO ₂ flooding for Increased Oil Recovery and Reduced Emulsion", SPE 39124	
Edmondson-Saunders, L.J., Sughal, A.K., "Lessons from Trinidad's CO ₂ Immiscible Pilot Projects 1973-2007", SPE 89364-MS	
Naimo, T.L., Banks, R.B., "Evaluation of Oil Reservoir Characteristics to Assess North Dakota Carbon Dioxide miscible flooding potential", http://www.kansu.edu/Research/PTTC/sites/index/2/26/26index.html	
Fact Sheet Author	Donald Remson
Fact Sheet Date	3/3/2009

NATIONAL ENERGY TECHNOLOGY LABORATORY

Attachment 10



Unconventional Resources Technology Advisory Committee

September 16, 2009


Technical Committee Report

Elena Melchert
DOE/Office of Oil and Natural Gas
Program Manager, EPart Title IX, Subtitle J
“Section 999”



Unconventional Resources Technology Advisory Committee

- **Section 999H(4)** ...*technical committee to ensure that in-house research activities ...are technically complementary to, and not duplicative of research conducted...* under the cost-shared research program.
- The Technical Committee met at the NETL facility in Morgantown, WV on August 6, 2009
- Technical Committee concluded that the projects comprising the NETL Complementary Research Program **are not duplicative** of those that comprise the cost-shared program.



**Unconventional Resources Technology
Advisory Committee**

September 16, 2009

Royalties Report to Congress

Elena Melchert
DOE/Office of Oil and Natural Gas
Program Manager, EPart Title IX, Subtitle J
“Section 999”



**Unconventional Resources Technology
Advisory Committee**

• **Requirement**

- Section 999B(e)(5) *Estimates of Increased Royalty Receipts*
 - Annual report to Congress
 - Estimated cumulative increase in Federal royalty receipts resulting from implementation of this subtitle.



Unconventional Resources Technology Advisory Committee

- **Strategy**

- Develop program benefits
- Apply royalties calculation methodology
- Prepare report to Congress



Unconventional Resources Technology Advisory Committee

- **Process/Next Steps**

- DOE completes Benefits Assessment Project for “2007 Portfolio” of projects
 - Update as portfolio is expanded
- DOE publishes Benefits Assessment to date
- DOE vets royalties estimates calculation methodology with MMS
- DOE prepares draft report for DOI/MMS
- DOE presents final report to OMB
- Secretary of Energy sends report to Congress

Attachment 11



NATIONAL ENERGY TECHNOLOGY LABORATORY



Technical Committee Review Report on Title IX, Subtitle J (EPA Act 2005) Complementary Research Program at NETL

August, 2009

EPAct 2005, Title IX, Subtitle J, Section 999
NETL COMPLEMENTARY R&D PROGRAM
TECHNICAL COMMITTEE REVIEW

**Assessment of Consortium-Administered Research and
NETL Research in Regards to Their Complementary
and Non-Duplicative Nature**

Prepared by:

**NATIONAL ENERGY TECHNOLOGY LABORATORY (NETL)
OFFICE OF RESEARCH AND DEVELOPMENT**

August 2009

Table of Contents

Executive Summary	4
Date/Location of the Meeting	5
Meeting Participants	5
Meeting Agenda/Discussion Topics/Process	6
Technical Committee Assessments and Comments	8
Drilling Under Extreme Conditions.....	8
Environmental Impacts of Oil and Natural Gas Development	8
Enhanced and Unconventional Oil Recovery	8
Resource Assessment.....	9
Findings.....	10
APPENDIX A.....	11
FY09 Technical Committee Member Contact Information.....	11
Technical Committee Qualifications	12
APPENDIX B	14
Technology Focus Areas/Program Elements Matrix	14

EPACT (2005), Title IX, Subtitle J, Section 999
NETL COMPLEMENTARY RESEARCH TECHNICAL COMMITTEE

**Assessment of Consortium-Administered Research and
NETL Research in Regards to Their Complementary
and Non-Duplicative Nature**

Executive Summary

The Energy Policy Act of 2005 (EPAct), Title IX, Subtitle J, Section 999, calls for the establishment and operation of a technical committee to ensure that in-house research activity — research carried out under the National Energy Technology Laboratory's (NETL) complementary R&D program elements — is technically complementary to, and not duplicative of, research conducted under the consortium-administered R&D program elements. NETL assembled this committee (the Complementary Research Technical Committee or CRTC) to review the elements of the Section 999 program and to make this determination, as required by the statute.

The CRTC met on August 6, 2009, at NETL in Morgantown, West Virginia, where both the NETL and consortium-administered R&D program elements were reviewed. Four industry professionals were selected to serve on the CRTC based on their qualifications and experience. **The committee determined that the complementary R&D program elements being carried out by NETL are not duplicative of the consortium-based program elements and are complementary in nature.**

Several members of the committee noted the potential for duplication between consortium-administered projects and NETL complementary research in areas related to:

- Gas shales,
- Produced water management,
- Database systems, and
- Environmental preservation.

The committee recommended that NETL and the program consortium continue routine and effective communications in order to avoid any potential future duplication of effort.

The responsibility for oversight and management of the program consortium lies with NETL. The Laboratory is fully committed to continuing – and enhancing – its communications with the consortium-administered programs to ensure that research conducted by NETL and R&D administered by the consortium remain complementary during the entire program life cycle.

A number of observations and comments were made by members of the committee during the course of the discussion were not specifically related to the charge of the committee and are not included in this report. These have been compiled however, and will be taken into consideration during ongoing and future planning.

Background

The Energy Policy Act of 2005 (EPAAct), Subtitle J, Section 999H(d)(4) calls for the establishment and operation of a technical committee to ensure that in-house research activities funded under section 999A(b)(4) — *research performed under the National Energy Technology Laboratory's (NETL) Complementary Program* — are technically complementary to, and not duplicative of, research conducted under paragraphs (1), (2), and (3) of section 999A(b) [*the consortium-administered R&D program*]. NETL formed this committee, the CRTC, to review the elements of the Section 999 programs and to make this determination, as required by the statute.

The CRTC is functional in nature and distinct from the two Federal advisory committees specifically established by the Energy Policy Act of 2005 (EPAAct) Subtitle J, Section 999D(a) and (b): the Ultra-Deepwater Advisory Committee (UDTAC) and the Unconventional Resources Technology Advisory Committee (URTAC). These two Federal advisory committees have been established to advise the Secretary on the development and implementation of programs under Subtitle J.

In terms of the CRTC, NETL sought participation by individuals who had the requisite qualifications to make such a determination, and assembled a capable and experienced committee.

Date/Location of the Meeting

The CRTC met on August 6, 2009 at NETL in Morgantown, West Virginia. The meeting was called to order by George Guthrie, Focus Area Lead, Geological and Environmental Systems, Office of Research and Development (ORD); and followed by John R. Duda, Director, Strategic Center for Natural Gas and Oil (SCNGO).

All of the committee members were in attendance.

Meeting Participants

The meeting participants included the following four committee members and NETL staff:

Committee Members (see Appendix A for key qualifications and contact information)

Sidney Green – *Business Development Manager for Schlumberger Data and Consulting Services*

Dr. Lanny Schoeling, P.E. – *Vice President of Engineering and Technical Development, Kinder Morgan CO₂ Company*

Richard Smith – *Regional Manager – Northeast, Weatherford International*

R. Glenn Vawter, P.E. – *President of ATP Services, LLC and Executive Director of the National Oil Shale Association.*

NETL Staff

John R. Duda – *Director, Strategic Center for Natural Gas and Oil*

Dr. George Guthrie – *Focus Area Lead, Geological and Environmental Systems, Office of Research and Development*

Jamie Brown – *Director, Earth and Mineral Sciences Division, Office of Research and Development*

Roy Long – *Technology Manager, Strategic Center for Natural Gas and Oil*

Most of the principal investigators responsible for the complementary research being carried out by NETL were also in attendance to provide details on individual projects as needed.

Research Partnership to Secure Energy for America (RPSEA) Consortium Staff

Arthur B. Schroeder – *Manager, Deepwater Technology & Commercialization*

Dr. Robert W. Siegfried – *Vice President, Unconventional Onshore*

Meeting Agenda/Discussion Topics/Process

The meeting began at 8 AM. George Guthrie presented the agenda and explained the purpose of the meeting and the process that would be followed. This was followed by an opening presentation by John R. Duda, who explained in detail the background behind the *charge* to the CRTC, including a discussion of the Section 999 legislation, the structure and operation of the consortium, the planning process, and how the Section 999-mandated research fits within the overall SCNGO natural gas and oil R&D program.

This was followed by two presentations on consortium-administered research projects by representatives of RPSEA. The first presentation by Bob Siegfried of RPSEA provided an overview of the consortium-administered program elements focused on Unconventional Resources and the Challenges of Small Producers. The second presentation by Art Schroeder of RPSEA provided an overview of the consortium-administered program elements focused on Ultra-deep Water.

Next were presentations providing a brief overview of the projects in each of the four program elements of NETL's Complementary Research Program, including select projects. These presentations were led by Jamie Brown who was supported by a cadre of principal investigators. The presentations covered the four program elements: Drilling Under Extreme Conditions, Environmental Impacts of Oil and Gas Development, Enhanced and Unconventional Oil Recovery, and Resource Assessment.

After these presentations, a member of the support staff to SCNGO, provided the committee members a portfolio-based matrix explained the lengths both RPSEA and NETL had taken to

avoid duplication. The portfolio-based matrix used to facilitate comparison of complementary and consortium-administered research program elements is provided in Appendix B.

After these opening presentations, the committee began a facilitated discussion related to each of the four NETL complementary research program elements plus Technology Transfer, in order:

- Drilling Under Extreme Conditions
- Environmental Impacts of Oil and Natural Gas Development
- Enhanced and Unconventional Oil Recovery
- Resource Assessment
- Technology Transfer

Because the consortium had awarded, or was close to awarding, over 70 projects using 2007 and 2008 funding, project abstracts for all consortium projects along with the 11 project summaries of the NETL Complementary Research Program were provided to committee members prior to the meeting for their review. The pre-meeting review package also included: Program Element tables that identified and sorted all projects by technology focus area; and, a copy of the charter authorizing the establishment of the Complementary Research Technical Committee.

At the meeting, each CRTC member was provided a briefing book that included: the Agenda, a Safety Briefing, an Attendee List, Reviewer Biographies, a copy of the presentations to be given at the meeting, EPart Section 999 FY 2009 Complementary Plan Projects, a draft of the 2009 NETL Complementary R&D Plan, the Technical Committee Charter, Technology Focus Areas/ Program Elements Matrix, a Sample Review Form, and abstracts of all consortium and NETL 2007 and 2008 projects.

The committee members were afforded the opportunity to question the NETL staff responsible for the in-house research as well as the RPSEA representatives in attendance.

During the facilitated discussion period, each program element was addressed with the objective of answering the following question: *Are the research program elements being conducted or planned by NETL complementary to and non-duplicative of the research program elements administered by the consortium?*

At the end of the program element discussion period, the members of the committee completed a form that indicated their individual determination as to the appropriate answer to the above question. They were also encouraged to add any comments they wished to provide to accompany their entries with respect to the charge given to them.

Following a final *wrap-up* discussion, the committee was adjourned by George Guthrie, the electronic forms were collected, and the committee members and other attendees were thanked for their participation.

Technical Committee Assessments and Comments

Representative CRTC member comments (written and verbal) related to the question of whether or not the NETL and consortium-administered program elements are complementary and non-duplicative, are summarized below.

Drilling Under Extreme Conditions

The committee determined that the program elements were not duplicative and were complementary. Only one committee member had a written comment, as indicated below:

- After reviewing the projects I didn't see any duplication.

Environmental Impacts of Oil and Natural Gas Development

The committee determined that the program elements were not duplicative and were complementary. Several members of the committee noted the potential for duplication between consortium projects focused on produced water management and recommended continued coordination between NETL (both ORD and SCNGO) and the consortium to avoid duplication in this area. Comments included:

- Again, currently these areas are not duplicating, however both parties need to communicate and work together to mitigate any duplication in the future. The areas to watch include RPSEA's Environmentally Friendly Drilling with NETL's environmental programs, and the Produced Water Management projects. In Produced Water management, the Subsurface Drip Irrigation project needs to communicate with and monitor the RPSEA Consortium Projects to ensure it is a complementary project.
- This is a very big issue in our industry and I am excited to see the above projects. Please make sure that good technology transfer is in place for water management. Also, be careful again about duplication down the road.
- There is potential for duplication between NETL's produced water management information system (PWMIS) and some RPSEA databases. Can they be integrated, or combined?

Enhanced and Unconventional Oil Recovery

The committee determined that the program elements were not duplicative and were complementary. Several members of the committee noted the potential for duplication between specific consortium projects and NETL projects and recommended continued coordination between NETL (both ORD and SCNGO) and the consortium to avoid duplication in this area. Comments included:

- Two of the above areas are critical for possible problems in the future if parties are not in communication with each other. These areas include the Marcellus Shale, and Water Management. I recommend both parties meet regularly and check they are complementing each other. I recommend that RPSEA's RFP's be in alignment with research at NETL. In the same way, NETL should monitor RPSEA's projects to see what areas they should get into, to complement those projects.
- After reviewing all of the projects, they are all complementary and non-duplicative. However, I would caution you that down the road some of the water management and gas shale projects could be duplicative in nature. Communication will be the key to make sure this does not happen.

Resource Assessment

The committee determined that the program elements were not duplicative and were complementary. Several members of the committee noted that there is potential for overlap and that continued communication will be necessary to avoid any duplication of effort. Comments included:

- This project is complementary and has no signs of duplication.
- Consider adding consortium databases to the NETL Knowledge Management Database.

The committee members agreed that the presentations, program-by-program reviews, and question-and-answer discussion gave them much confidence that duplication of effort is not occurring, and that programs are complementary. The committee acknowledged a strong willingness by all the players involved, to not duplicate efforts, and in fact to seek complementary programs.

Findings

The committee determined that the complementary R&D program elements being carried out by NETL are not duplicative of the consortium-based program elements and are complementary in nature. However, there is potential for overlap and continued close communication will be necessary to avoid any duplication of effort.

Areas of potential duplication are related to:

- Gas shales,
- Produced water management,
- Database systems, and
- Environmental preservation.

FINAL

APPENDIX A

FY09 Technical Committee Member Contact Information

Sidney Green

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Technical Committee Qualifications

The search for members of the Technical Committee was focused on individuals who met the following key qualifications:

- Possess a comprehensive appreciation of the technical challenges currently facing U.S. oil and gas producers.
- Possess a broad understanding of the current capabilities and limitations of the types of technology targeted under the Section 999 R&D program areas of focus.
- Possess a familiarity with R&D functions and an ability to assess research plans and identify areas of duplication.

The following individuals were chosen to be asked to participate on the Technical Committee based on the match between their expertise and the required qualifications listed above.

Sidney Green – *Business Development Manager for Schlumberger Data and Consulting Services*

- Co- founder and former CEO of TerraTek (acquired by Schlumberger).
- Research Professor in Mechanical Engineering and Civil and Environmental Engineering at the University of Utah.
- More than 40 years of experience in the area of geomechanics; well published holder of a number of patents.
- Engineering degrees from the University of Pittsburgh and from Stanford University; a Member of the U.S. National Academy of Engineers.

Dr. Lanny Schoeling, P.E. – *Vice President of Engineering and Technical Development for Kinder Morgan CO₂ Company*

- Former Chief Reservoir Engineer for unconventional at Shell E&P in oil shale. Previously responsible for evaluation of potential CO₂ candidates throughout the United States.
- Former Director of the North Mid-continent Regional Lead Organization, a part of the Petroleum Technology Transfer Council (PTTC).
- Ph.D. of Engineering in Petroleum Engineering, and a M.S. in Chemical Engineering from the University of Kansas.
- Professional Engineer in Texas and Kansas.

Richard K. Smith – *Regional Manager for the Northeast with Weatherford Fracturing Technologies, Weatherford International, Inc.*

- Former in-house engineer for the Royal Dutch Shell Company in Brunei.
- Former Technical Advisor with Mobil Oil working on non-core producing fields
- Former District Engineer for Halliburton executing hydraulic fracturing, technical and economic evaluation and financial performance and activity forecasting.
- M.S. and B.S. in Petroleum Engineering from West Virginia University.

R. Glenn Vawter, P.E. – *President of ATP Services, LLC, a consulting firm*

- Executive Director of the National Oil Shale Association.
- Energy Sector experience in oil/gas drilling, production, refining and transportation, oil shale technology research, international oil shale projects.
- Experience with major international oil companies, an independent oil producer, start-up companies, Fortune 150 technology development an oil refining firm, an R&D Institute and a construction mining firm, holding positions that ranged from Engineering Manager, Research Director, O&M Manager, Petroleum Refining/Marketing Manager, and Corporate Executive.
- B.S. degree from the Colorado School of Mines in Petroleum Engineering
- A registered professional engineer.

APPENDIX B

Technology Focus Areas/Program Elements Matrix

Program Elements

Technology Focus Areas

		Ultra-Deepwater	Unconventional Gas			Unconventional Oil (oil shale, oil sands, heavy oil)	Mature Fields (operated by small producers)
			CBM	Tight Gas Sands	Gas Shales		
Resource Development	Water Mgmt.	NA	1 project (2007)				
				2 Projects (2008)			
	Reduce Costs	15 Projects (2007) 9 Projects (2008)					2 projects (2007) 1 project (2008)
	Increase Recovery		5 projects (2007), 1 project 2008			Microwave heating Fractured media models Oil shale catalysts	CO2 EOR
Resource Character.	Subsalt Seismic Modeling (2007)	2 projects (2007)	6 projects (2007) 2 project (2008)	5 projects (2007) 3 project (2008)		4 projects (2007) 5 projects (2008)	
HPHT Resources	Drilling	Extreme Drilling Laboratory					
		HPHT Materials					
	Modeling	Composite Risers (2007) Managed Pressure Drilling (2008)	NA	NA	NA	NA	NA
Environmental Impact Assessment and Mitigation	Surface	NA	Ecological Impact of Oil and Gas Activities (EIOG)			Environmental Impacts of Unconventional Fossil Fuel Development (Oil Shale)	EIOG
			Environmentally Friendly Drilling (2008)				Low Impact Roads (2007)
	Air	Monitoring/Modeling Air Emissions from Oil and Gas E&P Activities					
	Water	Produced Water Management					
Technology Transfer		Knowledge Management Database (KMD) and RPSEA 2.6% Tech. Transfer			KMD/RPSEA Oil shale archive	KMD/RPSEA	

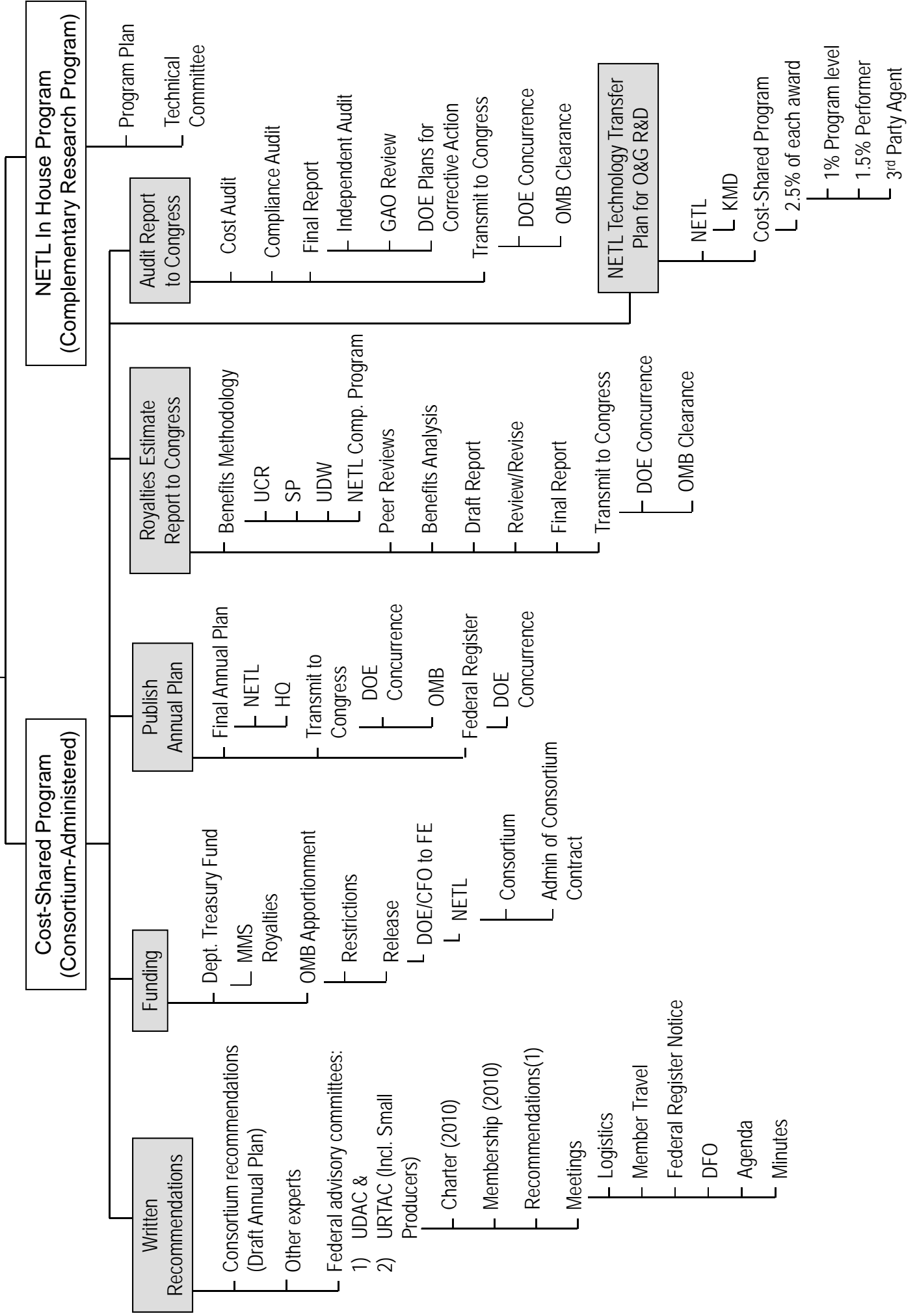
RPSEA-administered projects

Complementary projects



Attachment 12

Subtitle J Annual Deliverables



Attachment 13



Closeout: Program Status Update since July 15, 2009 Meeting

Roy Long, September 17, 2009



Review of Issues to Date

• Tech Transfer – Progress Toward Integrated Program:

- PTTC Award Complete
- RPSEA Project Summaries Complete
- Latest “E&P Focus” and “Fire in Ice” to be published this month
- RPSEA Forums Transitioning from Planning to Execution
- KMD: Basic Search Capability Online by October 1st
 - Demo to be Feature at SPE, ATCE in New Orleans
 - Plans being executed for improvement to include GIS within next two months
 - Continuous Improvement Program being established
- Benefits being quantified
 - Early Unconventional 2007 Program Results for 26 projects:
(Note: 9 projects not developed enough to estimate benefits)
 - 3.0 Billion Barrels / \$62 MM PV anticipated Royalties
 - 19.7 Tcf / \$140 MM PV anticipated Royalties

Timeline of Benefits Activities

March 2009	Unconventional Peer Review Conducted
June 2009	Unconventional Peer Review Report completed
September 1-2, 2009	Deepwater Peer Review Conducted
September 15-17, 2009	Briefing to FACA committee
November 2009	Submit both Peer Review Reports to HQ and Publish

3

NATIONAL ENERGY TECHNOLOGY LABORATORY

Guiding Principles for the Benefits Analyses

- **Transparency**
 - embrace professional judgment
- **Technology-centered, not model-centered**
 - capture the story of each project
 - aggregate project level results to program level
- **Apply an appropriate level of rigor**
 - update/expand as research progresses
- **Finite time horizon (30 years)**
 - Longer and you start counting resources that might become available without the program

4

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Review of Issues to Date (Continued)

- **Process**
 - NEPA requirements streamlined (paper study exclusion)
 - Other topics in review
- **Complementary Program**
 - ORD Merit and Technical Reviews Complete
 - Program declared non-duplicative by Technical Committee
 - Synergies being established with RPSEA Program
 - Materials Research
 - Equation of State Studies
 - Complementary Portfolio Analysis

Program Elements

		Ultra-Deepwater	Unconventional Gas			Unconventional Oil (oil shale, oil sands, heavy oil)	Mature Fields (operated by small producers)
			CBM	Tight Gas Sands	Gas Shales		
Resource Development	Water Mgmt.	NA	1 project (2007)				
	Reduce Costs				2 Projects (2008)		
	Increase Recovery	15 Projects (2007) 9 Projects (2008)	5 projects (2007), 1 project 2008			Microwave heating Fractured media models Oil shale catalysts	CO2 EOR 4 projects (2007) 5 projects (2008)
	Resource Character.	Subsalt Seismic Modeling (2007)			Marcellus Resource Assessment		NA
HPHT Resources	Drilling	Extreme Drilling Laboratory HPHT Materials Composite Risers (2007) Managed Pressure Drilling (2008)	NA	NA	NA	NA	NA
	Modeling	EOS for HPHT					
Environmental Impact Assessment and Mitigation	Surface	NA	Ecological Impact of Oil and Gas Activities (EIOG) Environmentally Friendly Drilling (2008)			Environmental Impacts of Unconventional Fossil Fuel Development (Oil Shale)	EIOG Low Impact Roads (2007)
	Air		Monitoring/Modeling Air Emissions from Oil and Gas E&P Activities				
	Water		Produced Water Management				
Technology Transfer		Knowledge Management Database (KMD) and RPSEA 2.5% Tech. Transfer			KMD/RPSEA Oil shale archive	KMD/RPSEA	

RPSEA-administered projects

Complementary projects

Program Elements

		Ultra-Deepwater	Unconventional Gas			Unconventional Oil (oil shale, oil sands, heavy oil)	Mature Fields (operated by small producers)
			CBM	Tight Gas Sands	Gas Shales		
Resource Development	Water Mgmt.	NA	1 project (2007)		2 Projects (2008)		
	Reduce Costs						2 projects (2007) 1 project (2008)
	Increase Recovery	15 Projects (2007) 9 Projects (2008)	5 projects (2007), 1 project (2008)				CO2 EOR
	Resource Character.	Subsalt Seismic Modeling (2007)		4	Marcellus Resource Assessment	Microwave heating Fractured media mode Oil shale catalysts	4 projects (2007) 5 projects (2008)
HPHT Resources	Drilling	Extreme Drilling Laboratory					
		HPHT Materials					
	Modeling	EOS for HPHT					
Environmental Impact Assessment and Mitigation	Surface	NA	2 Ecological Impact of Oil and Gas Activities (EIOG) Environmentally Friendly Drilling (2008)			EIOG	Low Impact Roads (2007)
	Air		Monitoring/Modeling Air Emissions from Oil and Gas E&P Activities			Environmental Impacts of Unconventional Fossil Fuel Development (Oil Shale)	
	Water		Produced Water Management				
Technology Transfer		Knowledge Management Database (KMD) and RPSEA 2.5% Tech. Transfer				KMD/RPSEA Oil shale archive	KMD/RPSEA

Technology Focus Areas


RPSEA-administered projects

Complementary projects

NATIONAL ENERGY TECHNOLOGY LABORATORY

7

Attachment 14



Unconventional Resources Technology Advisory Committee

September 15-16, 2009

Committee Calendar and Next Steps

Elena Melchert
DOE/Office of Oil and Natural Gas
URTAC Committee Manager



Unconventional Resources Technology Advisory Committee

- **Committee Calendar**
 - September / October: ad hoc Review Subcommittee meetings
 - October 6, 2009, draft report to URTAC Committee Manager
 - October 15, 2009, 8am-5pm, 11th URTAC Meeting in Los Angeles
 - October: Editing Subcommittee meets to prepare final report of URTAC comments and recommendations
 - October 20, 2009, Editing Subcommittee sends final report to the Committee Manager for distribution to the URTAC members
 - October 22, 2009, 1:00 pm EDT, 12th URTAC Meeting, Teleconference in Washington, DC to vote on Editing Subcommittee report
 - October 23rd, Chair delivers URTAC final report of comments & recommendations to the Secretary of Energy

Unconventional Resources Technology Advisory Committee

- **Next Steps by October 6, 2009**

- Ad hoc Review Subcommittee meetings to develop subcommittee comments and draft recommendations.
- Subcommittees prepare findings, comments, and draft recommendations.
- Subcommittees prepare final report on findings, comments, and draft recommendations
- Subcommittee final report due to Committee Manager by October 6, 2009 via email.

Unconventional Resources Technology Advisory Committee

- **Next Steps: October 15, 2009 URTAC 11th Meeting**

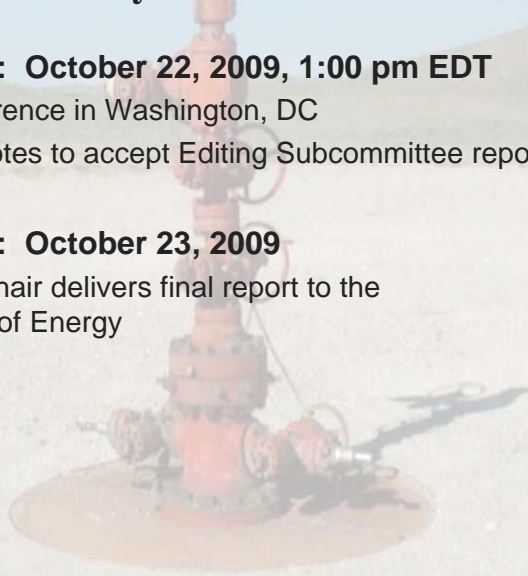
- Review Subcommittee Chairs present comments, findings and draft recommendations at URTAC meeting in Los Angeles on October 15, 2009.
- URTAC reaches consensus on final recommendations

- **Next Steps by October 20, 2009**

- Editing Subcommittee prepares final report and sends report to Committee Manager via email
- Committee Manager forwards final report to members.

Unconventional Resources Technology Advisory Committee

- **Next Steps: October 22, 2009, 1:00 pm EDT**
 - Teleconference in Washington, DC
 - URTAC votes to accept Editing Subcommittee report
- **Next Steps: October 23, 2009**
 - URTAC Chair delivers final report to the Secretary of Energy



Attachment 15

The Review Subcommittees were formed and chairs included:

2010 Portfolio

- Nick Tew (Chair)
- Jessica Cavens
- James Dwyer
- Jeff Hall
- Bob Hardage
- Don Sparks

2007-2008-2009 Portfolio

- Sally Zinke (Chair)
- Nancy Brown
- James Dwyer
- Chris Hall
- Shahab Mohaghegh
- Don Sparks
- Janet Weiss

Prior Recommendations

- Nancy Brown (Chair)
- Scott Anderson
- Chris Hall
- Fred Julander
- Ray Levey
- Janet Weiss

Technology Transfer

- James Dwyer (Chair)
- Bill Daugherty
- Chris Hall
- Bob Hardage

Metrics and Benefits Assessment

- Sandra Mark (Chair)
- Nancy Brown
- Bill Daugherty
- Chris Hall
- Ray Levey
- Shahab Mohaghegh

Executive Summary & Policy

- Chris Hall (Chair)
- Jeff Hall
- Fred Julander
- Sandra Mark
- Don Sparks

Editing

- Chris Hall (Chair)
- James Dwyer
- Jeff Hall
- Sally Zinke