

Ultra-Deepwater Advisory Committee (UDAC)

September 16-17, 2009

Eleventh Meeting

Meeting Minutes

Ultra-Deepwater Advisory Committee

I hereby certify that this transcript constitutes an accurate record of the Ultra-Deepwater Advisory Committee meeting held on September 16-17, 2009.



Arnis Judzis, Vice Chair
Ultra-Deepwater Advisory Committee

7-2-10

Date

**Minutes of the 11th Meeting of the Ultra-Deepwater Advisory Committee
(San Antonio, TX, September 16-17, 2009)**

Call to Order

The meeting was called to order¹ at 1:30 PM on September 16th by Mr. Arnis Judzis, Vice Chair. As the Acting Chair of the meeting (Chair), he reminded all that the purpose of this meeting was for the Ultra-Deepwater Advisory Committee (UDAC) to begin review the DOE *Draft 2010 Annual Plan* in order to develop written recommendations and advice to the Secretary of Energy.

Committee Business: Change of Membership

Ms. Elena Melchert, DOE Committee Manager (CM), informed the UDAC that according to the DOE Office of General Counsel, Mr. Ray Charles and Mr. Richard Mitchell were no longer able to represent their employers due to retirement and therefore, no longer able to serve as representative members on the UDAC.

Committee Business: Quorum

The CM informed the group that the UDAC membership now totaled 12 members, and that the quorum was now comprised of seven members. By call of the roll of members², she reported that only six UDAC members were present. She informed the Designated Federal Officer (DFO), Mr. Guido DeHoratiis, that a quorum was not present. She stated that because the approved agenda reflected that the meeting had been structured as informational only and that no consensus decisions would be developed during the meeting, the meeting of the UDAC could proceed³. The DFO agreed to allow the meeting to continue despite the lack of quorum.

Remarks by the Designated Federal Officer

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 14, 2009 in Los Angeles, CA.

Presentations and Discussion

The Chair reviewed the agenda and introduced each speaker in turn.

Overview of Ultra-Deepwater Research (UDW) in the DOE Draft 2010 Annual Plan

Mr. Judzis introduced Mr. Mike Ming, RPSEA⁴, who presented an overview of the entire RPSEA *2010 Draft Annual Plan* (Attachment 3). He highlighted the high degree of participation in the UDW 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 plans⁵. He indicated that the release of solicitations for proposals for the funding year 2009 was imminent. Mr. Ming summarized the number of projects that had been selected for the

¹ Agenda included as Attachment 1.

² List of all members and other persons present at the meeting included as Attachment 2.

³ Per prior discussions with DOE Office of General Counsel

⁴ Research Partnership to Secure Energy for America (RPSEA)

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

2007 and 2008 project portfolios of the UDW. Approximately 50 research projects are currently underway.

Mr. Ming described the structure of the UDW advisory committees, which include hundreds of volunteer advisors, more than 50 meetings related to the UDW. These are primarily TAC⁶ and PAC⁷ meetings. He recognized the considerable number of volunteer hours.

He informed the UDAC that RPSEA's objective was to evolve the UDW from a large number of smaller projects to a small number of larger demonstration projects.

Overview of UDW Project Portfolio in the DOE Draft 2010 Annual Plan

The Chair then recognized Mr. Hani Sadek of Chevron and *DeepStar*, a subcontractor to RPSEA for administration of the UDW. Mr. Sadek gave a detailed presentation on the UDW project portfolio (Attachment 4). He provided some details on the PAC and TAC structure in the UDW and how those RPSEA advisory bodies work. He described efforts to collaborate with international research and development partners and with the various alliances with universities that support the UDW.

Mr. Sadek described the base cases that characterize the technology challenges upon which the initial plan⁸ was based: subsalt, high temp, heavy oil, sour production. He described the low reliability/high risk environment in which deepwater operators are involved. He highlighted the time gap associated with conversion of new discoveries to proven reserves, and the step change increase in offshore development costs.

Further, he provided details related to the UDW objectives, and the critical needs that drive them. The issue of completion and intervention costs, and the fact that these costs are driving development economics, and therefore need research to find ways to reduce these costs, was discussed. He also talked about the need to extend tieback systems to enable development of smaller, uneconomic fields.

Questions about the UDW and the DOE Draft 2010 Annual Plan

In answering questions, there was some discussion about technology transfer and the fact that project performers must indicate to RPSEA how they are going to engage in technology transfer⁹. Mr. Sadek responded to a question about the announcement of large discoveries in the Gulf of Mexico (e.g., BP's Tiber discovery), saying that these large discoveries highlight the need for new technologies to turn such discoveries into proven reserves. He reiterated that the focus of the UDW is exactly on this conversion.

With regard to the changing/evolving needs in research and development, Mr. Sadek responded that the TACs and PAC keep track of how these needs are changing, and

⁶ Technical Advisory Committee (TAC), an advisory committee to RPSEA

⁷ Program Advisory Committee (PAC), an advisory committee to RPSEA

⁸ 2007 Annual Plan

⁹ EPLA, Title IX, Subtitle J, Section 999C(d) Technology Transfer requires that 2.5% of the amount of each award be designated for technology transfer and outreach activities.

recommend adjustments to the UDW plan accordingly. In response to a question about how funding is distributed amongst the various needs, Mr. Sadek and Mr. Art Schroeder, RPSEA, responded that the PAC sets funding ranges that are adjusted based on the quality of the proposals received in response to the planned solicitations.

There was a question about the total amount of research money obligated to date versus spent. Mr. Sadek responded that the total for awarded and selected projects in the 2007 and 2008 portfolios was about \$27 million. The actual amount of money spent (costs incurred) has been for only the 2007 projects (about \$14-15 million), and only about 10-30% (~\$8 MM) of that has actually been spent to date (these are 2-3 year projects that are about one year into their work plans and RPSEA's contract with the DOE/National Energy Technology Laboratory operates on a reimbursement basis).

In response to a question about how RPSEA evaluates projects relative to safety and environmental risk topics, Mr. Schroeder responded that the requests for proposals have specific language to address environment, health, and safety, and that there is a weighting factor involved. He said that there are several projects that are entirely focused on the environment. However, a member commented that there appear to be no projects that focus on how the infrastructure impacts the environment, only how the environment impacts the infrastructure.

There was some discussion focused on the difference between increasing the resource base (finding more, increasing recovery), versus converting these discoveries to reserves. He said that both are targeted. There was also a question about the actual definition of "ultra-deepwater" in Section 999¹⁰ (it is 1500 meters of water or about 5000 feet of water).

There was some discussion about tight formations and viscous crudes particularly in the Keathley Canyon Area, and the fact that there appeared to be few projects in the portfolio focused on improving production rates by enhancing completions. Mr. Schroeder indicated that there might be more focus on this in coming years. He also said that the research project focused on subsea processing is an example of how the portfolio is addressing the need to reduce backpressure. Mr. Sadek reinforced the notion that in the future there would be additional focus on completions.

There was a question about the responsibility of the UDAC with regard to commenting on the annual plan versus recommendations related to the overall UDW. The CM responded, stating that the specific objective of this meeting was to review the DOE *Draft 2010 Annual Plan* (Plan) for the purpose of developing written comments and recommendations on the Plan in the September/October timeframe, and that the UDAC also has responsibility for providing advice to the Secretary of Energy regarding the entire UDW.

In response to a question about how RPSEA uses information/findings gathered from international research programs or programs reported on by other organizations, Mr. Sadek said that the PAC is provided with the information gathered. Mr. Ming added

¹⁰ EPA Act Title IX, Subtitle J, Section 999A-H

some details about how the various RPSEA forums and meetings with international groups have added input into the *RPSEA 2010 Draft Annual Plan*.

Overview of Technology Transfer

The Chair then recognized Mr. Roy Long, NETL, who presented the status of NETL's technology transfer efforts (Attachment 5). His presentation included a live demonstration of the Knowledge Management Database (KMD) conducted in real time by staff in Morgantown, WV over the Internet. This presentation was well received.

One member remarked that it is important to make sure that the data are the best available and are traceable back to the key data providers. Mr. Morton Wiencke remarked that a workshop was to be held in November 2009 related to a similar project ("Arctic Web") underway internationally.

Overview of RPSEA's Environmental Advisory Group

Dr. Rich Haut, HARC, presented information on the Environmental Advisory Group (EAG) and described its current activities (Attachment 6).

After the presentation, discussion focused on the role of the EAG within RPSEA, asking if it functioned as a TAC (answer: no), and the mechanism by which the EAG provides input to the other TACs. There was also some discussion related to the need for research that focuses on options/responses to leaks in ultra-deepwater, particularly associated with subsea production.

Committee Discussion

The Chair worked with the Facilitator, Mr. Karl Lang, to establish the objectives and membership of the Review Subcommittees and the Editing Subcommittee. The two Standing Subcommittees on Portfolio and Process were designated by the UDAC as the Review Subcommittees (Attachment 7).

The charge of the Portfolio Review Subcommittee was to review the *DOE Draft 2010 Annual Plan* in terms of: Balance, Barriers & Opportunities, Value, and Diversity. The charge of the Process Review Subcommittee was to review the *DOE Draft 2010 Annual Plan* in terms of: Speed of Awards, Program Process or Metrics, and Benchmarking. Both these assignments are consistent with the charter of each Standing Subcommittee.

The meeting was suspended until the following day.

The Chair called the meeting to order at 8 AM on September 17, 2010. The agenda of presentations and discussion continued.

NETL Complementary Program

Dr. George Guthrie, NETL, provided details on all elements of the NETL Complementary Research Program: drilling under extreme conditions (including the

ultra-deep drilling simulator), unconventional oil and enhanced oil recovery projects, and environmental impacts projects (Attachment 8).

Update on Overall Section 999 Program¹¹

Ms. Elena Melchert, DOE Program Manager for Oil and Gas Research, provided an update on several items (Attachment 9): the status of the Royalties Report to Congress, status of the Ocean Policy Task Force, the Technical Committee Report (Attachment 10) required for the NETL Complementary Research Program. She also updated the UDAC on the DOE position on the issue of noise associated with subsea processing facilities and its impact on marine mammals.

Legislative Update on Congressional Activities Affecting Section 999

Mr. Guido DeHoratiis, DOE Director for Oil and Gas Resource Conservation, then provided a legislative update. He explained that the House of Representatives (HR) version of the Fiscal Year 2010 Budget was silent on the Administration's request to repeal Subtitle J¹² of the Energy Policy Act. He recounted that Senate Energy Bill 1462 contained language to take a portion of UDW and NETL Complementary Research Program funds from Section 999 to fund a seismic inventory of offshore resources. He also reported that the HR language for the Interior Department Appropriations Bill called for deferring Section 999 funds deposited into the Ultra-Deepwater Fund¹³ for Fiscal Year 2010. He also reported that there is no comparable language in the Senate version of the bill.

Mr. DeHoratiis also described the Defense Authorization Bill that calls for changing the use of Ultra-Deepwater Fund for the benefit of disabled retired military veterans beginning with Fiscal Year 2011 funds. Mr. DeHoratiis agreed to keep the UDAC informed of any further action on legislative activity targeting Section 999.

Standing Subcommittee Reports

Mr. Quenton Dokken, Chair of the Standing Subcommittee on Portfolio, gave a brief report on the Subcommittee's progress. He reported that he was pleasantly surprised to see that the implementation of the UDW had addressed some of the past recommendations of the UDAC. Mr. Dokken described the Subcommittee's work to develop a survey instrument to evaluate the portfolio of projects. He recognized the lack of data by having only one year's worth of projects¹⁴ and the need to look at a multi-year portfolio. He also reported that the 2007 Project Portfolio was diverse in scope but that it was too early to tell how diverse the overall program would be. He said that he was pleased to see additional efforts around environmental topics, something that was

¹¹ EPL Title IX, Subtitle J, Sections 999A-999H

¹² EPL Title IX, Subtitle J, Sections 999A-999H

¹³ EPL Title IX, Subtitle J, Section 999H(f) Fund establishes the "Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund".

¹⁴ The portfolio of projects available to the Standing Subcommittee at the time of their meetings was limited to the 2007 Project Portfolio as the 2008 project contracts were not yet in place.

deficient in the UDW portfolio. He noted that barriers to a more robust research portfolio included: inadequate funding, and an award process that is slow and cumbersome.

In the absence of Ms. Mary Jane Wilson, Chair of the Standing Subcommittee on Process, Mr. Paul Tranter provided a brief report on the Subcommittee's progress. There had been no significant changes since the last meeting¹⁵. There was a general feeling of frustration amongst the members at the time delay associated with getting contracts awarded and money spent.

Status Update on NETL Oversight of the UDW

Mr. Roy Long, NETL, provided an overview of NETL's oversight activities as of the last meeting¹⁶ (Attachment 11). He presented the status of the Benefits Assessment Project that was underway by the NETL Office of Systems, Analysis, and Planning.

Discussion focused on how the information on potential benefits would be made available to the public, and the timing of release of specific benefits assessment results. Ms. Melchert noted that the UDAC recommendations could be made without specific numerical results. Comments from the UDAC focused on the need to communicate the notion that technology is the key to unlocking resources, and that technology transfer is important in translating potential benefits into actual benefits.

UDAC Calendar and Next Steps

The CM reviewed the UDAC calendar and next steps (Attachment 12). She reiterated action items for the next meeting (October 14, 2009 in Los Angeles). These included: send the Process Subcommittee report to all members; invite Dr. Haut to Portfolio Subcommittee meetings for questions; provide details on how much money has been spent to date; make the UDAC aware of progress regarding the Benefits Assessment Project, and provide analysis output by the next UDAC meeting, if possible; request the 2008 UDAC project portfolio survey be completed and available to the Portfolio Subcommittee; provide Mr. Weincke with a copy of the subsea noise information binder prepared by Ms. Melchert and available at meeting for review by the members); set up teleconferences needed for review of the DOE *Draft 2010 Annual Plan* by the Review Subcommittees; provide updates on legislative activity as needed; and send Review Subcommittee names to all members.

The CM also outlined the next steps: the meeting on October 14, 2009 in Los Angeles, CA to finalize the UDAC recommendations, and the subsequent October 22, 2009 teleconference in Washington, DC for final approval of the Editing Subcommittee report.

The Chair presided over some brief discussion about the work to be completed by the Review Subcommittees prior to the next meeting, before adjourning the meeting at approximately 12 noon.

¹⁵ 10th Meeting of the Ultra-Deepwater Advisory Committee, Conference Call held July 15, 2009

¹⁶ See #15 above

Attachments

| | Presenter | Topic |
|----|--------------------|---|
| 1 | For the Record | Meeting Agenda |
| 2 | For the Record | Committee Members and Meeting Participant Attendance |
| 3 | Mr. Mike Ming | Overview of RPSEA <i>2010 Draft Annual Plan</i> |
| 4 | Mr. Hani Sadek | Ultra-Deepwater Research Project Portfolio |
| 5 | Mr. Roy Long | Technology Transfer : KMD Demonstration |
| 6 | Dr. Rich Haut | Environmental Advisory Group (EAG) Current Activities |
| 7 | For the Record | Members of Two Standing Subcommittees |
| 8 | Mr. George Guthrie | NETL Complementary Research Program Status |
| 9 | Ms. Elena Melchert | Status Updates: Royalties Report to Congress, Ocean Policy Task Force, the Technical Committee Report, and other issue. |
| 10 | For the Record | Technical Committee Report |
| 11 | Mr. Roy Long | Status of the Benefits Assessment Project |
| 12 | Ms. Elena Melchert | UDAC Calendar and Next Steps |

Attachment 1

Ultra-Deepwater Advisory Committee
September 16-17, 2009
Crowne Plaza Riverwalk, 111 E. Pecan Street, San Antonio, TX

September 16, 2009

1:00 PM

Central Daylight Time

Public Registration

| | | |
|-------|---|--|
| 12:30 | <i>Members assemble</i> | |
| 1:00 | <i>Ethics Briefing [Members only] Via WebEx and Conference Call</i> | <i>Krys Urchick, DOE Office of General Counsel</i> |
| 1:30 | Call to Order/ Welcome / Introductions | Kent Abadie, 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: Ultra-Deepwater Program</i> | Hani Sadek, DeepStar Director Chevron Energy Technology Company RPSEA Vice President Ultra-Deepwater |
| 2:50 | Committee Discussion | Kent Abadie |
| 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 | Kent Abadie |
| 4:10 | Overview of RPSEA's Environmental Advisory Group | Rich Haut, Chair RPSEA Environmental Advisory Group |
| 4:30 | Committee Discussion and Q/A | Kent Abadie |
| 4:40 | Committee discussion and planning for the review of the <i>2010 Annual Plan</i> --Establish Review Subcommittees --Establish the Editing Subcommittee | Kent Abadie/Facilitator |
| 5:00 | Suspend proceedings until next day 8 am | Kent Abadie |

Ultra-Deepwater Advisory Committee
September 16-17, 2009
Crowne Plaza Riverwalk, 111 E. Pecan Street, San Antonio, TX

September 17, 2009

| | | |
|-------|---|---|
| 7AM | Member Breakfast / Open Registration | |
| 8:00 | Call to Order/Old Business | Kent Abadie |
| 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 | Committee Discussion and Q/A | Kent Abadie |
| 8:50 | Section 999 Program: --Royalties Report to Congress --Technical Committee Report --Subsea Processing Facility Noise | Elena Melchert, DOE Program Manager Office of Oil and Natural Gas |
| 9:10 | Committee Discussion and Q/A | Kent Abadie |
| 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 Reports: --Process --Portfolio | Mary Jane Wilson, Subcommittee Chair Quenton Dokken, Subcommittee Chair |
| 10:20 | NETL Close Out: --Status update as of last meeting --Benefits Assessment | 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 | Kent Abadie |
| 12:00 | Adjourn | Kent Abadie |

APPROVED:



Guido DeHoratiis, Designated Federal Officer

9/10/09
Date

Attachment 2

**Ultra-Deepwater Advisory Committee Meeting
Sign-In Sheet - September 16-17, 2009**

| Last Name | First Name | Organization | Sign |
|---------------|------------|--|-------------------------|
| Abadie | Kent F. | Shell Exploration & Production Company | UNABLE TO ATTEND |
| Cicio | Paul N. | Industrial Energy Consumers of America | UNABLE TO ATTEND |
| Daulton | Daniel J. | BJ Services Company | UNABLE TO ATTEND |
| Dokken | Quenton R. | Gulf of Mexico Foundation | <i>John D. Duke</i> |
| Fowler* | Joe R. | Stress Engineering Services, Inc. | <i>Joe R. Fowler</i> |
| Ikelle* | Luc T. | Texas A&M University | UNABLE TO ATTEND |
| Judzis | Arnis | Schlumberger, Inc. | <i>Arnis</i> |
| Seamount, Jr. | Daniel T. | Alaska Oil & Gas Conservation Commission | UNABLE TO ATTEND |
| Sears* | Stephen | Louisiana State University | <i>SO Sears</i> |
| Tranter | Paul T. | Transocean, Inc. | <i>Paul T. Tranter</i> |
| Wiencke | Paul M. | Research Council of Norway | <i>Paul M. Wiencke</i> |
| Wilson* | Mary Jane | WZI Inc. | UNABLE TO ATTEND |

* Special Government Employee

Ultra-Deepwater Advisory Committee Meeting

Public Walk-In List - September 16-17, 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 |
| Siegfried | Bob | RPSEA |

Ultra-Deepwater Advisory Committee Meeting
September 16-17, 2009

Staff Roster

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

| | | |
|---------|---|----------------------------|
| X EM | Guido DeHoratiis Acting Deputy Assistant Secretary | Designated Federal Officer |
| | Elena Melchert Program Manager for Section 999 | Committee Manager |

National Energy Technology Laboratory

| | | |
|------------------|---------------------|---|
| JSC BH NLO | Roy Long <i>RPL</i> | 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.

| | | |
|-------------------|----------------|--------------------------------------|
| X PM J X | Karl Lang | Meeting Minutes Recorder/Facilitator |
| | Rob Matey | Meeting General Support |
| | Janie Castillo | Registration Support |
| | William Pike | General Support |

Attachment 3



FACA review RPSEA; 2010 Annual Plan Overview

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



Secure Energy for America

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

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



Secure Energy for America

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 |



Secure Energy for America

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 |

Secure Energy for America



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 |

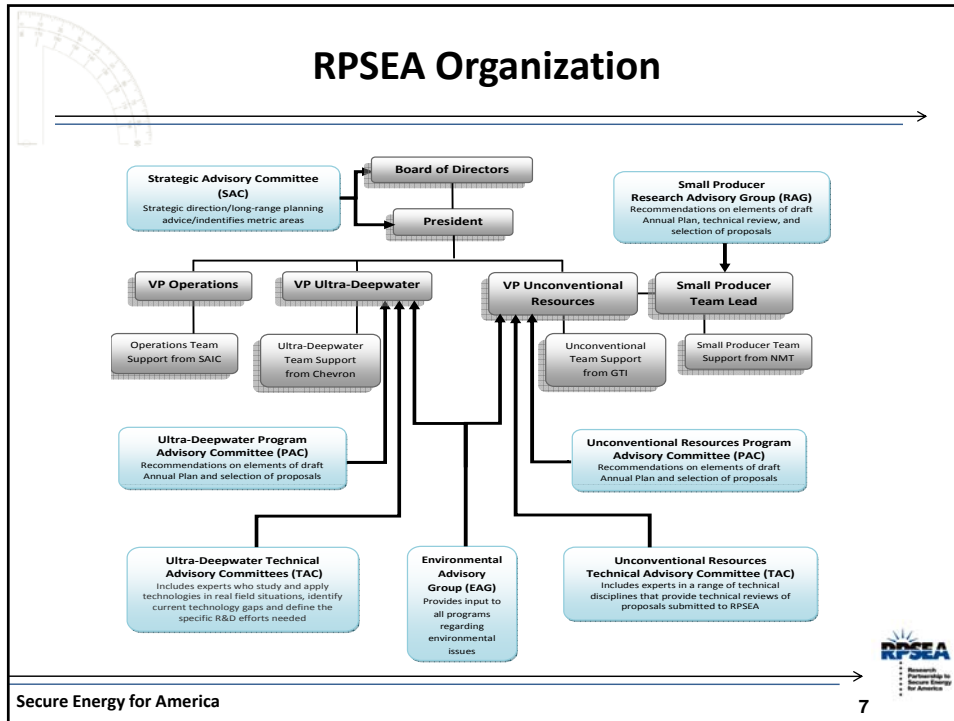
Proposal Value (\$000)

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

Secure Energy for America



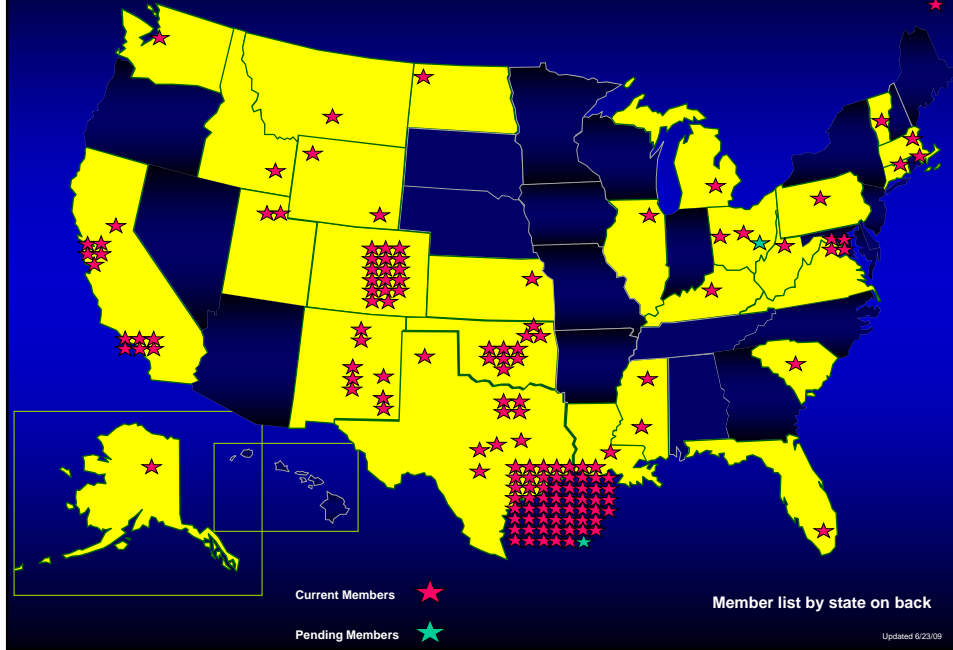
RPSEA Organization



RPSEA 2010 dAP Stakeholder Involvement

- Since inception
 - 75 advisory committee and other meetings with:
 - 1,838 participants
 - 6,800 hours
 - 25 RPSEA member forums with:
 - 1,335 attendees
 - Total 11,800 hours

RPSEA Members

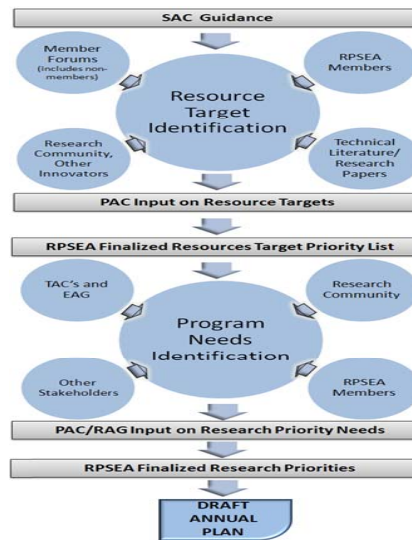


| | | | |
|--|---|--|---|
| Alaska University of Alaska Fairbanks | Louisiana State University | Apache Corporation Apex Spectral Technology BP America, Inc. Baker Hughes Incorporated BJ Services Cameron/Curtiss-Wright EMD Capstone Turbine Corporation CARBO Ceramics, Inc. City of Sugar Land ConocoPhillips Company CSI Technologies, Inc. Deepwater Structures, Inc. Deepwater XLP Technology, LLP Det Norske Veritas (USA) Energy Valley, Inc. ExxonMobil Corporation GE/VetcoGray Grantherm, 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 | North Dakota Western Standard Energy Corporation | Virginia Advanced Resources International, Inc. American Gas Association Independent Petroleum Association of America Integrated Ocean Drilling Program |
| Connecticut APS Technology, Inc. | Mississippi Jackson State University Mississippi State University | Ohio NGO Development Corporation The Ohio State University Wright State University | Washington Quest Integrated, Inc. |
| Florida Florida International University | Montana Nanco Resources | 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 | West Virginia West Virginia University |
| 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 | South Carolina University of South Carolina | Wyoming EnerCrest, Inc. WellDog, Inc. |
| Illinois Gas Technology Institute | North Carolina The University of North Carolina | Texas Acute Technological Services, Inc. Anadarko Petroleum Corporation | Newfoundland, Canada Centre for Marine CNG, Inc. |
| Kansas The University of Kansas | | | |
| Kentucky NGAS Resources, Inc. | | | |
| Louisiana | | | |

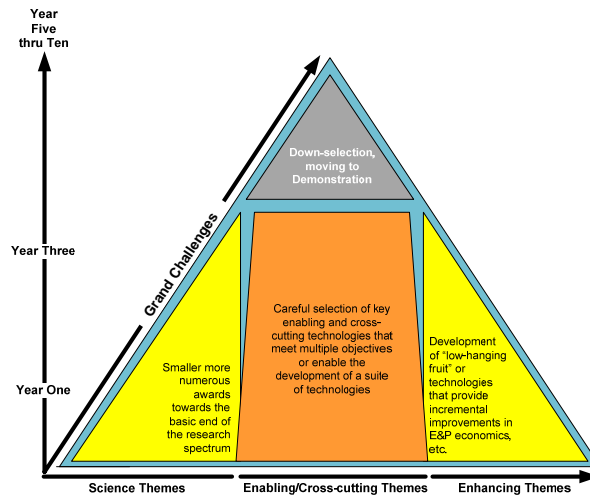
RPSEA 2010 dAP Objectives

- Meet EPACT 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

RPSEA 2010 dAP Process Flow



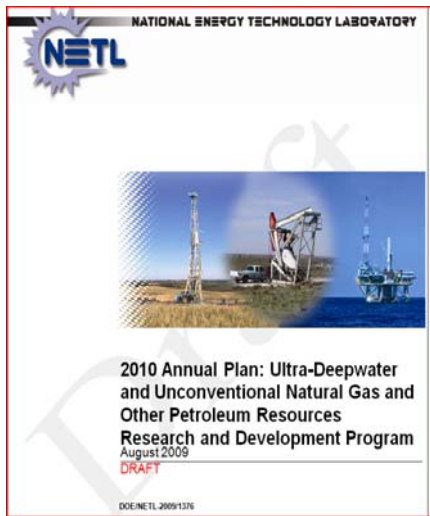
RPSEA 2010 dAP Portfolio Guidance



RPSEA 2010 FACA Presentation Outline

- Environmental emphasis for the overall program
 - Environmental Advisory Group (EAG) description by Rich Haut
- Individual program presentations will include:
 - Resource drivers
 - Portfolio development specific to each program
 - Program status
 - 2010 R&D plan
 - Technology transfer

RPSEA; Annual Plan overview

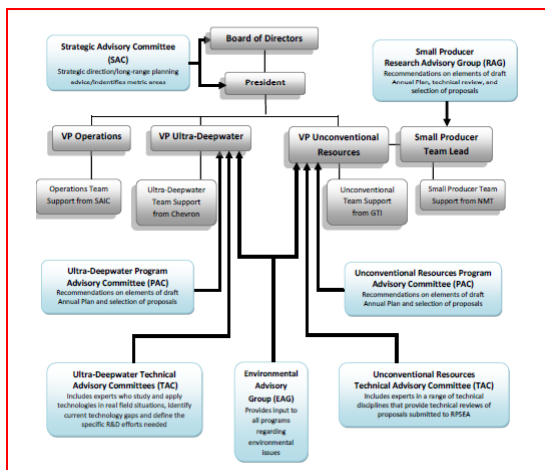


- Executive Summary
- 1. Background
- 2. Overall Implementation Scheme
 - 2.1 Ultra-Deepwater Program Element**
 - 2.2 Unconventional Natural Gas
 - 2.3 Small Producer Program Element
 - 2.4 Solicitation Process
 - 2.5 Project Management
 - 2.6 Technology Transfer
 - 2.7 Performance Metrics and Program Benefits Assessment
- Appendix A: Title IX, Subtitle J of EPAct 2005 Sections 999A through 999H
- Appendix B: RPSEA Membership and Committee List
- Appendix C: RPSEA 2010 Draft Annual Plan

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RPSEA Organization and Advisory Committees



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Attachment 4

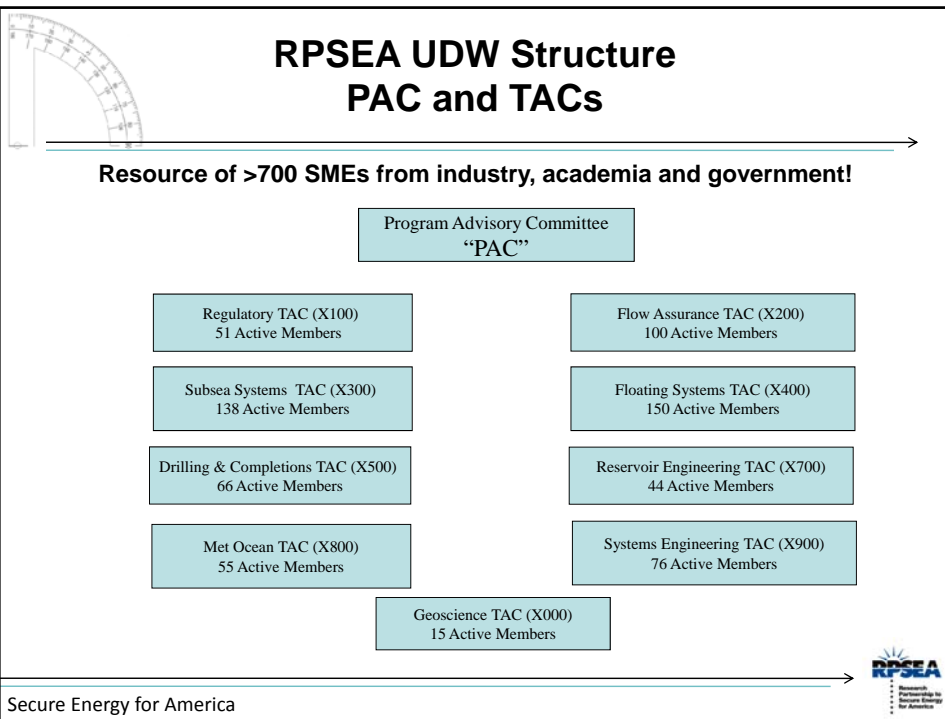


FACA review RPSEA; 2010 Annual Plan Overview

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



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International Collaboration UDW Program Input

International

Professional Societies

**RPSEA;
Invited Organization**

Regional and local

Universities

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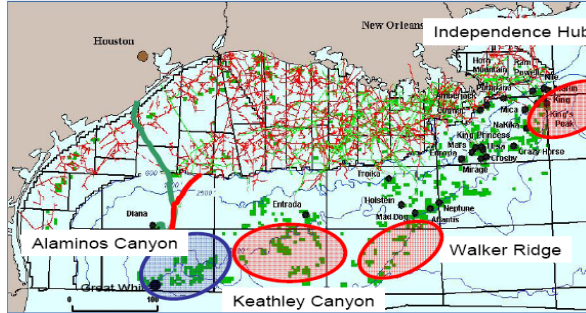
UDW Program is “Technology and Architecture Focus”

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.

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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

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Increasing Lag Between Discovery and Development

Proven Reserves Add Value

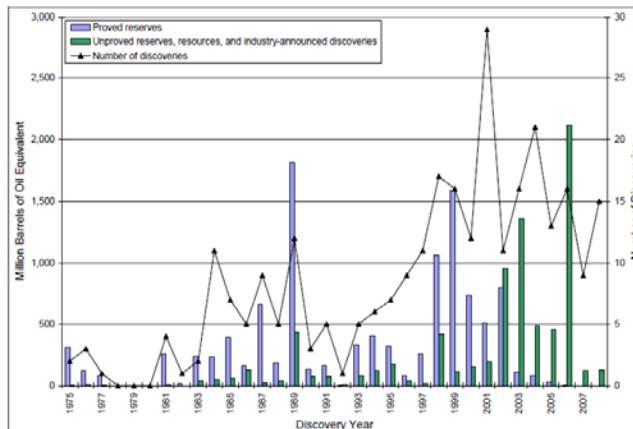


Figure 22. Number and volume of deepwater discoveries. Volumes include MMS reserves, MMS resources, and industry-announced discoveries.

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

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Need to reduce costs

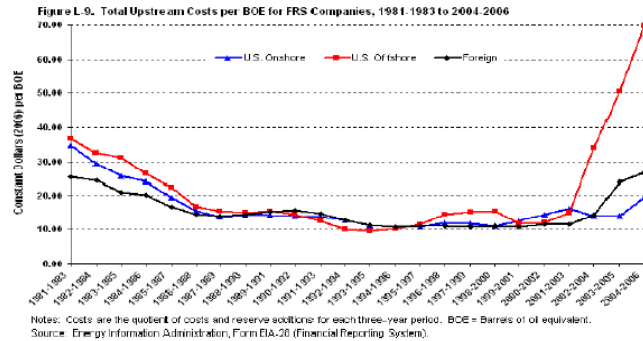


Figure 5. Cost per Barrel of Oil Equivalent (BoE) per US Department of Energy, Energy Information Agency (EIA) January 2008, for companies reporting to EIA's Financial Reporting System (FRS). It does not include state-owned oil companies. <http://www.eia.doe.gov/inec/infosheets/crudeproduction.html>

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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.

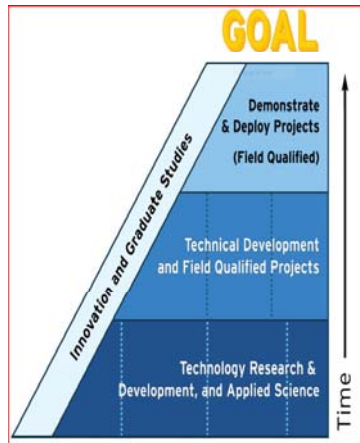
This goal will be achieved by:

- 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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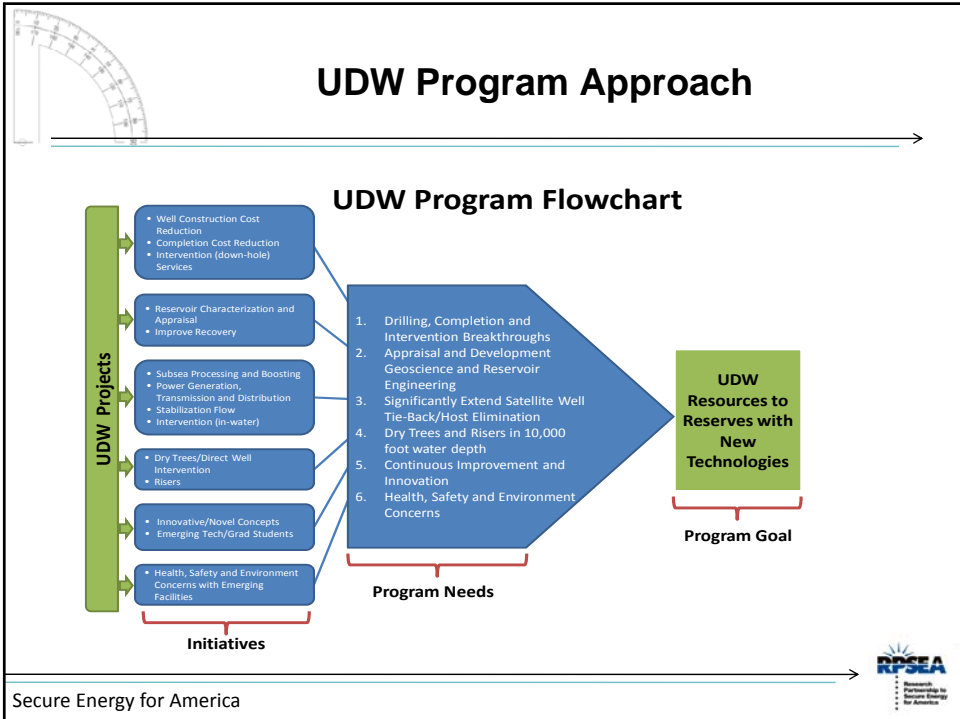
UDW Program 'Needs'

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

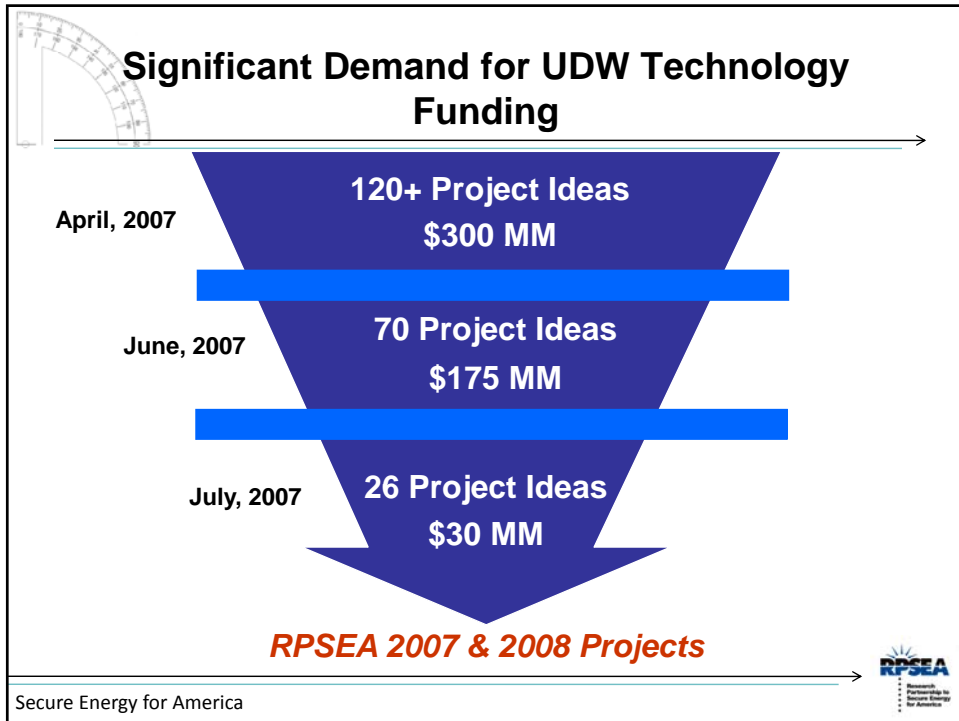
Proposals under this drilling initiative are expected to have the potential to significantly reduce the cost of UDW well drilling operations.

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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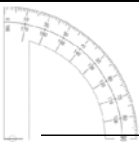


2010 UDW Activities

- 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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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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Program-Level Technology Transfer

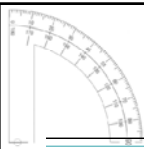
- Funded by 1% Set-aside
- Managed by RPSEA
 - Website Enhancements
 - Coordination with NETL KMD,
 - Events at Major Technical Conferences (SPE, OTC, SEG, etc.)

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Questions?



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Attachment 5



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 displays the KMD Portal page with the following elements:

- Header:** "the ENERGY lab" logo with the tagline "Where energy challenges converge and energy solutions emerge". A "Site Map" link and a "GO" button are visible.
- Navigation Menu (Left):** ABOUT NETL, KEY ISSUES & MANDATES, RESEARCH, TECHNOLOGIES, ENERGY ANALYSIS, SOLICITATIONS & BUSINESS, EDUCATION, NEWSROOM, CONTACT NETL.
- Main Content Area:**
 - Knowledge Management Database (KMD) Portal:** A brief overview of the portal's search capabilities.
 - Document Database:** Describes the search function for documents from past and current R&D projects, including links to the CD/DVD library, NETL Internet site, and other sources.
 - CD/DVD Database:** Describes the search function for CD and DVD content from past R&D programs and currently available documents.
 - Section 999 Database:** Describes the search function for project summaries related to the Energy Policy Act of 2005, Title IX, Subtitle J, Section 999 R&D program.
 - Section 999 Tech Transfer Index (DLS-115K9):** Describes the search function for technology transfer products (reports, publications, presentations, etc.) produced for individual research projects.
 - GIS and Data Visualizations:** Describes the search function for spatial data related to research projects, including USGS, MMS, EIA, and EPCA data sets.

4

NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

KMD Document DB Search Page

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

Site Map GO>

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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NATIONAL ENERGY TECHNOLOGY LABORATORY

KMD Demonstration

KMD Document DB Search Results

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

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TITLE & ABSTRACT: hydraulic fracturing And ▾

AUTHOR:

Search Reset

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. Vierpanski, 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 coregri-3 or mineback4.5 have shown that hydraulic fractures are complicated multi-stranded structures that

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KMD Demonstration

CD/DVD Database Search Page

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

Site Map GO

ABOUT NETL
KEY ISSUES & MANDATES
RESEARCH
TECHNOLOGIES
ENERGY ANALYSIS
SOLICITATIONS & BUSINESS
EDUCATION
NEWSROOM
CONTACT NETL

KMD Portal > CD DVD Database

Search the KMD CD/DVD Database

This search function allows the user to search all of the CDs and DVDs of research reports compiled from past R&D programs and currently available from the NETL library. The user can download individual reports or order an entire CD or DVD. See our [instructions](#) for additional information.

Search KMD CD/DVD Database

TITLE: 3-D Seismic Exploration Project, Ute Indian Tribe, Uintah & Ouray Reservation, Uintah County, Utah (PDF-543MB)
[RIGHT CLICK TO DOWNLOAD]

INFO: Four Disk Set

DATE: May 2005

TITLE: A Geologic Playbook for Trenton-Black River Appalachian Basin Exploration (PDF-112MB)
[RIGHT CLICK TO DOWNLOAD]

INFO: A playbook containing maps, integrated, multi-faceted, resource assessment model was developed for the origin of the Trenton-Black River reservoirs in New York, Ohio, Pennsylvania and West Virginia. This effort defined potential reservoir fairways for conducting detailed studies which could potentially lead to further exploration and discovery of gas fields.

DATE: July 1, 2006

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KMD Demonstration

CD/DVD Database Search Results

NETL the ENERGY lab
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Site Map GO

Marcellus shale drilling (site:netl.doe.gov) Search Advanced Search Search Tips

Search Results 1 - 10 of about 81 for Marcellus shale drilling (site:netl.doe.gov). Search took 10.04 seconds.

Next Start by date / Sort by relevance

prev Technically Recoverable Devonian Shale Gas in Ohio, West Virginia ...
... This study represents the spacing and the drilling of a series of ... organically rich, deep Marcellus shale, which has had very little development to date. ...
www.netl.doe.gov/kmd/cds/disk1/E/GS/5C/Technically%20Recoverable%20Devonian%20Shale%20Gas%20in%20Ohio%20and%20West%20Virginia.pdf - 2005-01-10 - Text Version

prev UGR_C220 - "Black Shale and Sandstone Facies of the Devonian" ...
... long life spans. Drilling in the area continued throughout the 1000's and into ... of the Marcellus shale facies exhibits the pattern of southeastward thickening ...
www.netl.doe.gov/kmd/cds/disk1/E/GS/5C/Black%20Shale%20and%20Sandstone%20Facies%20of%20the%20Devonian%20Basin.pdf - 2002-04-01 - Text Version

prev UGR_022 - "Subsurface Stratigraphy and Gas Production of the ...
... be equivalent to parts of the Marcellus, Hamel, and ... of mapping areas of thick Brown shale and identifying ... primary drilling areas, the outline of Brown shale ...
www.netl.doe.gov/~/Subsurface%20Stratigraphy%20and%20Gas%20Production%20of%20the%20Devonian%20Basin.pdf - 2002-01-26 - Text Version

prev UGR_061 - "Stratigraphic and Geographic Distribution of Core in ...
... 14 Feet Drilling Co ... 1482 DF, TD 12343 (Marcellus - Onondaga) 27 California Company 4056-4066 Kippe ... 1 (E4/Bore Shale) 1150 # of 37%, Huntersville 2009 W of 80 ...
www.netl.doe.gov/~/0%20-%20Shales/Stratigraphic%20and%20Geographic%20Distribution%20of%20Core.pdf - 2002-02-04 - Text Version

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KMD Demonstration

Section 999 Database Search Page

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

KMD Portal > Section 999 Database

Search the KMD Section 999 Database

This search function allows the user to search only project summaries related to the Energy Policy Act of 2005, Title IX, Subtitle J, Section 999 R&D program. Each of these project summaries, which are updated regularly, contains links to all of the research products related to that specific project. See our [instructions](#) for additional information.

Search Section 999 Database

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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KMD Demonstration

Section 999 Database Search Results

NETL the ENERGY lab
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treatment of produced water (or) Search Advanced Search Search Tips

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

Next:

[NETL EPAct Projects: Cost-Effective Treatment Of Produced Water...](#)
... Project Information Cost-Effective Treatment Of Produced Water Using Co-Produced Energy Sources For Small Producers 07123-05. Goal ...
[www.netl.doe.gov/technologies/oil-gas/EPAct2005/Projects/SPR/0712305-NewMexicoTech.html](#) - 36k - 2009-09-01 - [Cached](#)

[NETL EPAct Projects: An Integrated Framework for the Treatment...](#)
... Goal This project seeks to develop an integrated decision framework that can be utilized in the management and treatment of produced water, resulting in a ...
[www.netl.doe.gov/technologies/oil-gas/EPAct2005/Projects/UNC/071223-C2M.html](#) - 44k - 2009-09-01 - [Cached](#)

[2008 Plan for the NETL Complementary Research and Development...](#)
... Identifying and exploiting opportunities to use passive treatment technologies as pretreatments for the membrane treatment of produced water or as a low ...
[www.netl.doe.gov/technologies/oil-gas/EPAct2005/2008_Draft_NETL_Complementary_Plan.pdf](#) - 2009-07-26 - [Text Version](#)

[NETL EPAct2005 - NETL Complementary Research](#)
... may include fundamental studies related to domestic enhanced oil recovery (EOR), unconventional oil, treatment and beneficial use of produced water, and basic ...
[www.netl.doe.gov/technologies/oil-gas/EPAct2005/CompResearch.html](#) - 22k - 2009-08-13 - [Cached](#)

KMD

NATIONAL ENERGY TECHNOLOGY LABORATORY

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

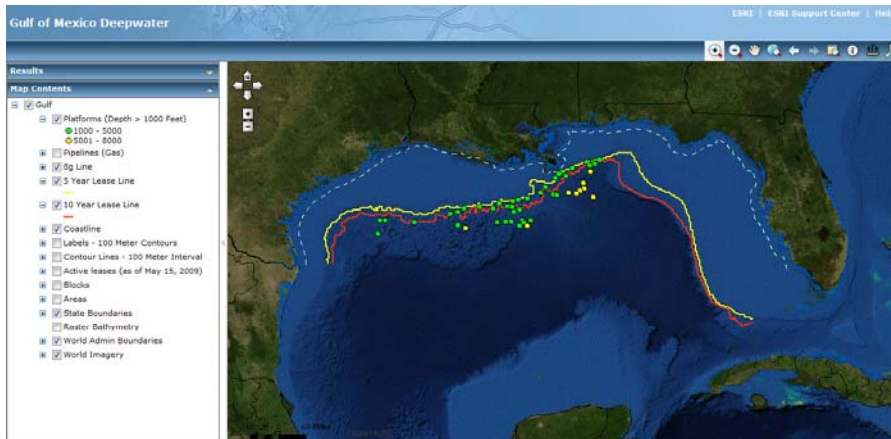
- **ArcGIS Web Map Services to allow visualization of data related to oil and gas research**
 - Gulf of Mexico (GOM) Deepwater
 - **Data from the Minerals Management Service related to leases (i.e. 5- and 10-year lease lines, active leases, 8g line, coastline, state boundaries, and leases by water depth 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/streams, highways, railroads, and major cities
 - **Data from the Energy Information Administration**
 - Boundary data for U.S. oil and gas field maps
 - Coalbed methane cumulative production, reserves and resources, and gassy coal mines
 - Shale gas basins and plays

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KMD Demonstration

Gulf of Mexico Deepwater Prototype

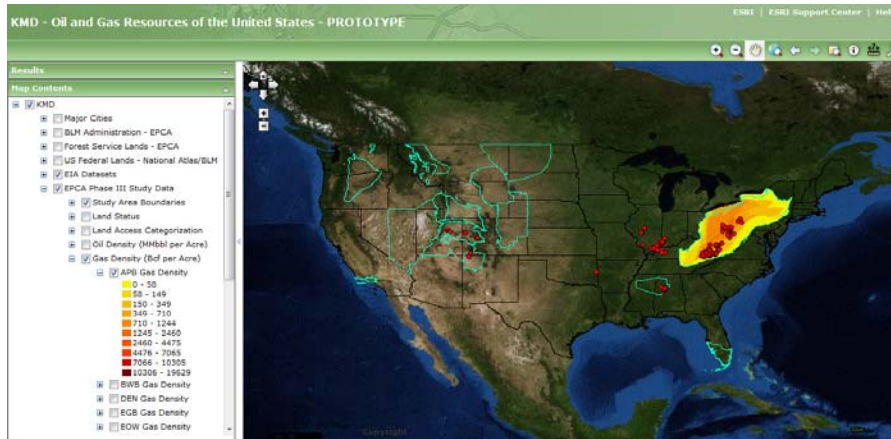


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KMD Demonstration

Oil and Gas Resources of the United States Prototype



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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

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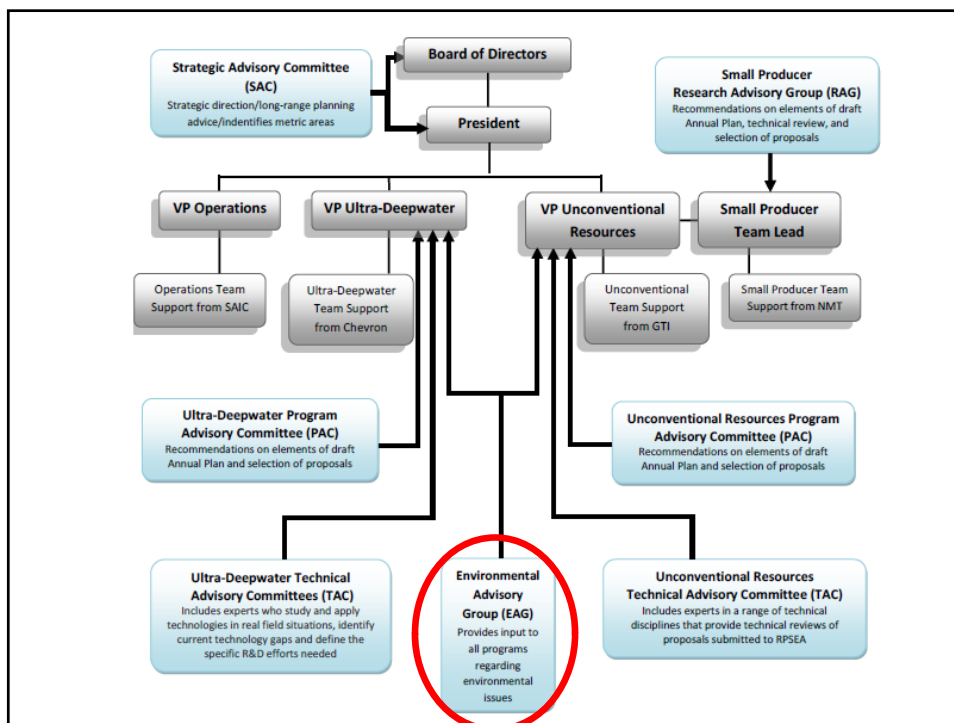
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Attachment 6



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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•
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•

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.

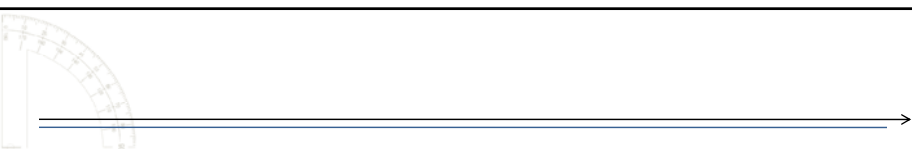
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Research Funded by Texas Environmental Research Consortium (TERC)

- 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
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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. | High | High | High | High | 5 | ... |
| Second scenario with energy produced at point of use with small commercial PWR, with bank of lithium ion batteries used for energy storage. | Medium | Medium | Medium | Medium | 3 | ... |
| Third scenario with energy produced at point of use with small commercial PWR, with bank of lithium ion batteries used for energy storage. | Medium | Medium | Medium | Medium | 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.

ECOSYSTEM CLASSIFICATION APPROACH:
 The classification of local-scale ecosystems (ecotypes) combines physiography (i.e. coastal, floodplain, alpine), topography (DEM modeling), and vegetation structure associated with land cover types derived from satellite image processing to model ecotypes that best partition geomorphic, hydrologic, pedologic, and vegetation characteristics.

DATA SOURCES:
 1:500,000 scale DEM, National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984), National Wetlands Inventory (NWI) (1984)

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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Houston Advanced Research Center
rhaut@harc.edu
281-364-6093

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Attachment 7

Sub-Committee Members

Portfolio Sub-Committee

Quenton Dokken – Chair
Arnis Judzis
Joe Fowler
Steve Sears
Paul (Morton) Wiencke
Paul Cicio

Process Sub-Committee

Mary Jane Wilson - Chair
Paul Tranter
Luc Ikelle
Kent Abadie
Dan Seamount

Editing Sub-Committee

Kent Abadie - Chair
Dan Daulton
Arnis Judzis
Quenton Dokken

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

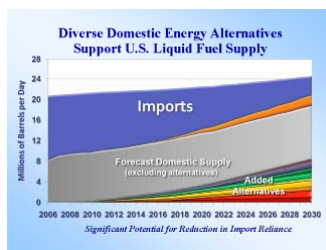


**Complementary Program consists of research
conducted by NETL's ORD and OSAP.**

**Office of Research
& Development**



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



**Extramural Research
and Collaboration**



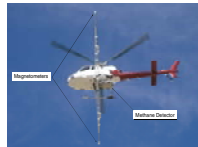
- **Annual Merit Review** (this year held on 15–16 July 2009)
 - External panel review of scientific and technical quality of projects
- **Annual Technical Committee Review** (this year held on 6 August 2009)
 - Annually assesses complementary and non-duplicative nature
- **Institute for Advanced Energy 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

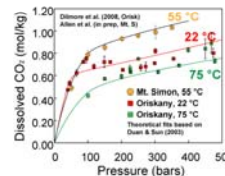
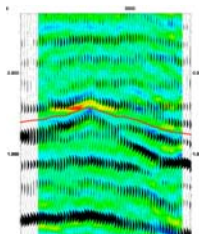
CO₂ Storage

- 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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3

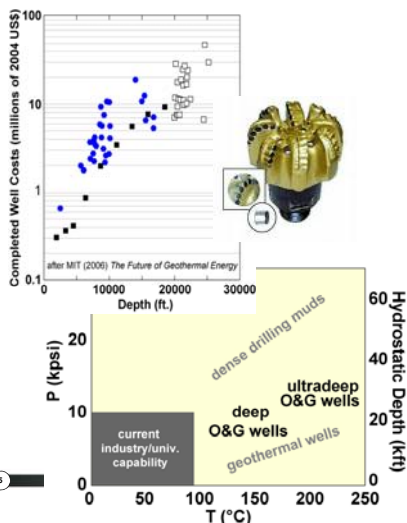
| | | Ultra-Deepwater | Unconventional Gas | | | Unconventional Oil (oil shale, oil sands, heavy oil) | Mature Fields (operated by small producers) |
|--|---------------------|---|---|---------------------------------------|---------------------------------------|---|---|
| | | | CBM | Tight Gas Sands | Gas Shales | | |
| Resource Development | Water Mgmt. | NA | 1 project (2007) | | 2 Projects (2008) | | |
| | Reduce Costs | 15 Projects (2007) 9 Projects (2008) | 5 projects (2007), 1 project 2008 | | | | 2 projects (2007) 1 project (2008) |
| | Increase Recovery | | 2 projects (2007) | 6 projects (2007) 2 project (2008) | 5 projects (2007) 3 project (2008) | Microwave heating Fractured media models Oil shale catalysts | CO ₂ 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 | | | | | |
| | 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

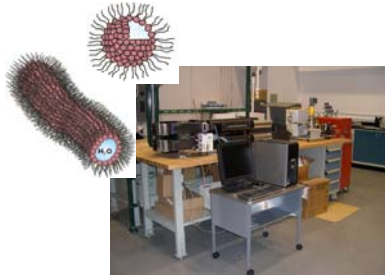
- Evaluation of strategies for effective and environmentally sound disposition of produced waters
 - Produced water database (PWWIS)
 - Evaluation of potential options (subsurface drip irrigation; ephemeral streams) ★
 - Quantitative models via a portfolio of monitoring options (airborne, UAV, hyperspectral, 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) ★

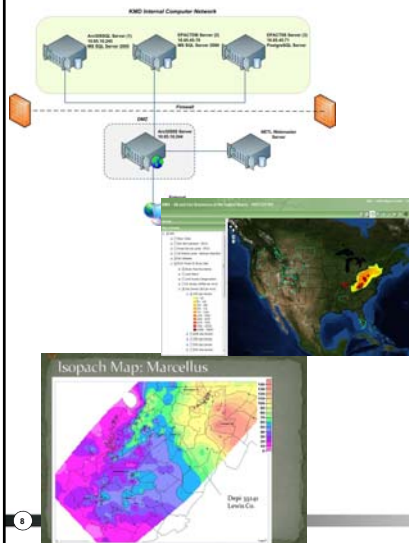
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NATIONAL ENERGY TECHNOLOGY LABORATORY

★ 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

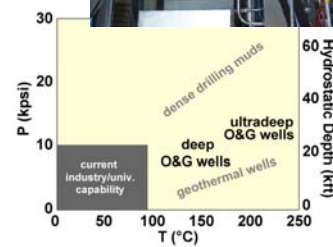
- Drilling costs increase exponentially with depth
- Observation of drilling dynamics limited (experimentally challenging)

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



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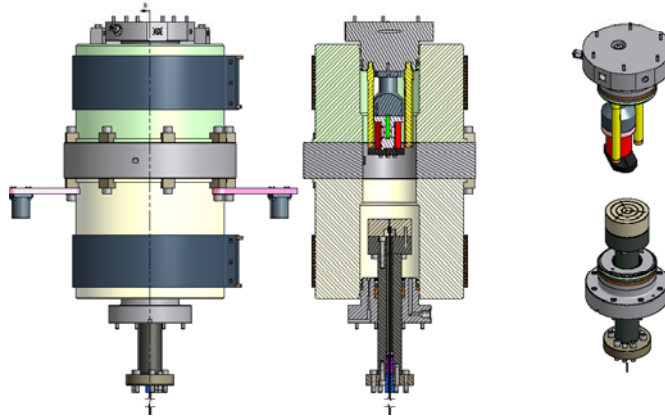
Ultra-deep Drilling Simulator



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NATIONAL ENERGY TECHNOLOGY LABORATORY

Ultra-deep Drilling Simulator



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Calendar Year 2009 Objectives

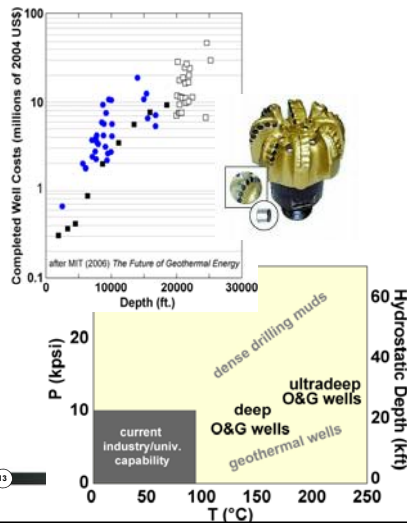
- **Proof test pressure vessel at TerraTek**
(Completed instead at NETL in March 2009)
- **Ensure full functionality of UDS at NETL**
(Underway and expected to be completed by September 2009)
 - Perform series of functionality and shakedown testing
 - Install and shakedown x-ray system
- **Conduct baseline 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

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NATIONAL ENERGY TECHNOLOGY LABORATORY

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

NATIONAL ENERGY TECHNOLOGY LABORATORY

★ 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

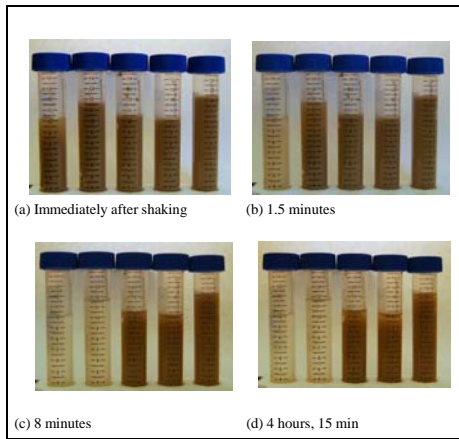
- Currently, polymeric additives are used but they degrade quickly at HTHP
- Use of nanoparticles for this application is a new concept, but mechanisms and controlling factors are not known

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

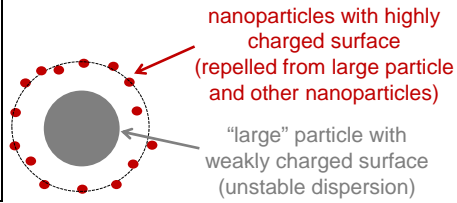
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Nanoparticle addition can stabilize barite suspensions.



Proposed mechanism:
"Nanoparticle haloing"*

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

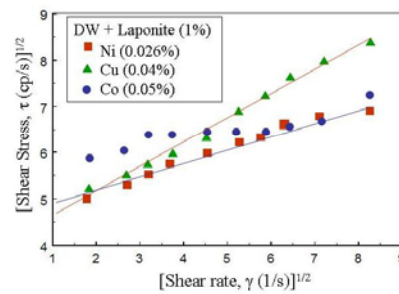
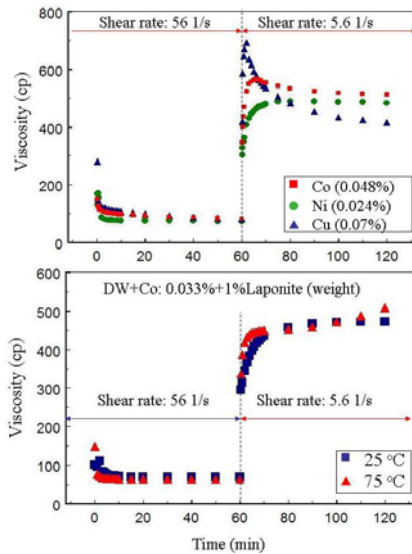


Settling of barite suspensions as a function of time in (from left to right) deionized water, NaOH solution, three different concentrations of silica nanoparticles

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

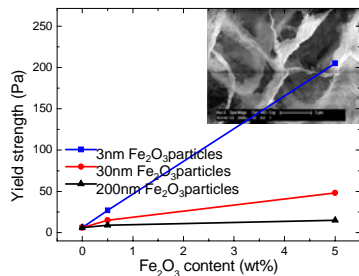
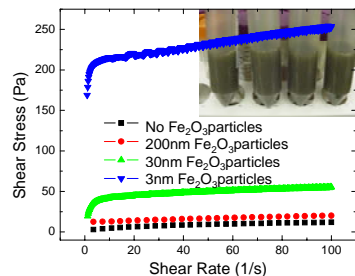


- Fast gel break down and build up
- High gel strength for suspending weighting materials
> 2.2 N/m² & 1.7 N/m² for Ni- & Cu-laponite (barite suspension requires ~0.5 N/m²)

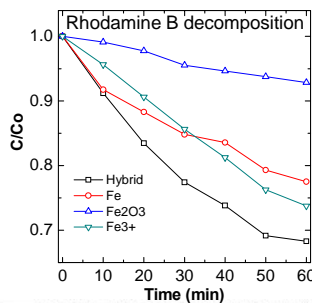
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Hybrid nanoparticle mixtures could lead to tunability.



- 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.



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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)

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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

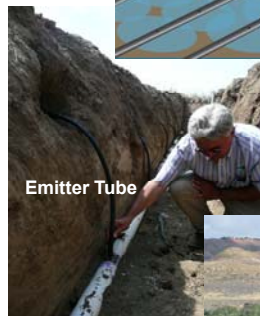
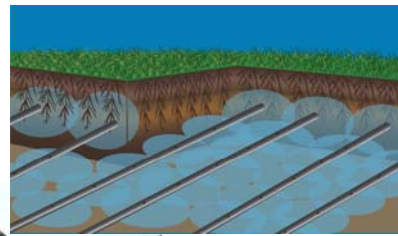
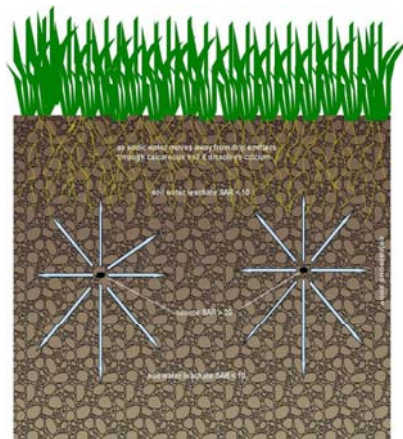
- Airborne and ground-based electromagnetic surveying, hydrology, and geochemistry

Key Collaborations

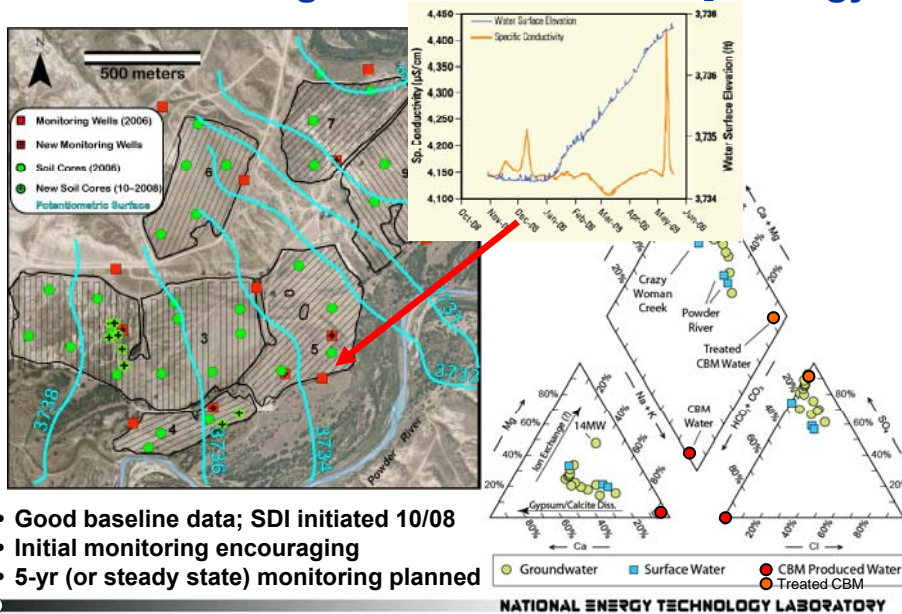
- USGS
- BeneTerra LLC (CRADA partner, agronomy, soil science)
- Wyoming DEQ
- Anadarko (CRADA partner, funding and site access)



Subsurface Drip Irrigation-Installation



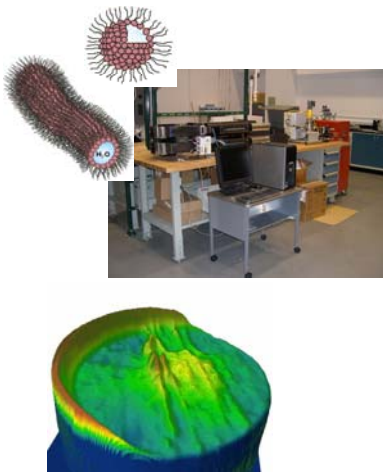
SDI Monitoring and Groundwater Hydrology



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

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)** ★

★ 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

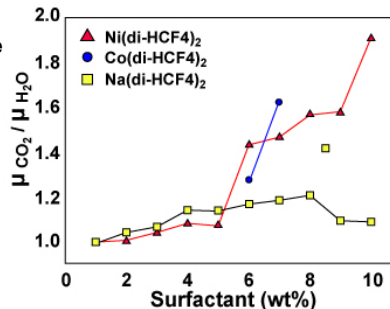
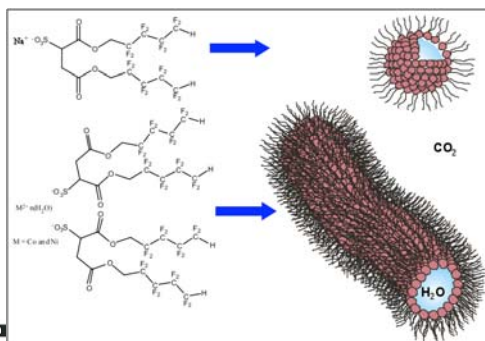
(2) Dhanuka, Dickson, Ryoo, Johnston; J. of Colloid and Interf. Sc.; 298 (2006) 406-418

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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.

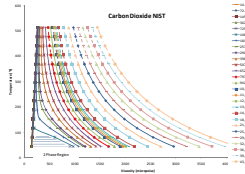
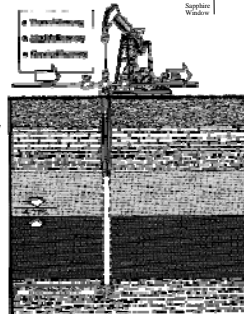
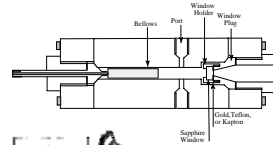
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Equation-of-State Modeling for Extreme Geological Conditions



- 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

Acoustic Impacts on Marine Mammals from Subsea Oil & Gas Processing



DOE Strategy to Address Noise from Subsea Petroleum Processing Technologies



Marine Mammals and Noise
Marine Mammal Commission
March 2007

Advisory Committee on Acoustic Impacts on Marine Mammals
Marine Mammal Commission
February 2006

Effects of Subsea Processing on Deepwater Environments in the Gulf of Mexico
Minerals Management Service
May 2008

Addressing the Effects of Human-Generated Sound on Marine Life
Joint Subcommittee on Ocean Science & Technology (JSOST)
January 2009

**MMS Workshop
Nov. 17-19, 2009
Boston, MA**

Noise Types & Thresholds
High Level, Intermittent
Low Level, Continuous

Facilities Utilizing Subsea Petroleum Processing Technologies



| Facility | Ceiba | Chinook | Draugen | Lufeng | Lyell | Marimba | Marlim | Mulinээр/Exeter | Perdido | Topacio | Troll C | Tordis |
|--------------|-------------|----------------|-----------|-----------------|-----------|-----------|-----------|-----------------|----------------|-------------|-----------|---------------|
| Operator | Hess | Petrobras | Shell | Statoil | CNRL | Petrobras | Petrobras | Sanlos | Shell/Chevron | ExxonMobil | Statoil | Statoil-Hydro |
| Location | West Africa | Gulf of Mexico | North Sea | South China Sea | North Sea | Brazil | Brazil | Australia | Gulf of Mexico | West Africa | North Sea | North Sea |
| Depth (feet) | 2,460 | 8,877 | 920 | 1,080 | 475 | 1,295 | 2,130 | 460 | 7,500 | 1,600 | 1,115 | 660 |

● Type 1 Facility ● Type 2 Facility



Ultra-Deepwater Advisory Committee

September 17, 2009

Technical Committee Report

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



Ultra-Deepwater 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.



Ultra-Deepwater Advisory Committee

September 16-17, 2009

Ocean Policy Task Force

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

Ultra-Deepwater Advisory Committee

- **Background**

- Established June 12, 2009 by Presidential memorandum to agencies
- Led by the White House Council on Environmental Quality (CEQ)
- By September 12, 2009 develop recommendation regarding national policy
- By December 12, 2009 develop a framework for improved stewardship and effective coastal and marine spatial planning.

Ultra-Deepwater Advisory Committee

- **Ocean Policy Task Force Members:**

- USDA, DOC, DOD, EPA, DOE, FERC, DOI, HHS, Joint Chiefs of Staff, DOJ, DOL, NASA, National Security Council, NSF, Navy, DOS, DOT, Office of the Vice President, OMB, WH Office of Energy and Climate Change, White House Office of Information and Regulatory Affairs, OSTP

Ultra-Deepwater Advisory Committee

- **Accomplishments**

- July 28, 2009 held Oil and Gas Stakeholder Roundtable
- August 21, 2009 Public Meeting in Anchorage, AK
- September 10, 2009 Presented recommendations for national policy to the President
- Online Public Comments invited
 - As of 9-14-09: 531 public comments received
 - <http://www.whitehouse.gov/administration/eop/ceq/initiatives/oceans/>

Ultra-Deepwater Advisory Committee



- **Next Steps**

- September 17, 2009 Field Hearing in San Francisco
- September 17, 2009 Stakeholder Roundtable on Marine Spatial Planning for Oil and Gas Stakeholders
- September 24, 2009 Field Hearing in Providence, RI
- Release national policy recommendations for public review
- Additional Field Hearings in other cities

Ultra-Deepwater Advisory Committee



- **Marine Spatial Planning**

- *A process for analyzing and allocating ocean space for multiple uses in order to achieve specified ecological, economic, and social objectives.* ---United Nations Educational, Scientific and Cultural Organization (UNESCO) Intergovernmental Oceanographic Commission (IOC)



Ultra-Deepwater 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”



Ultra-Deepwater 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.



Ultra-Deepwater Advisory Committee

- **Strategy**

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



Ultra-Deepwater 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 10



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

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| Environmental Impacts of Oil and Natural Gas Development | 8 |
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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 (EPAcT), 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 (EPAcT) 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, EAct 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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2006 Emerald Loft Circle
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Lanny_schoeling@kindermorgan.com

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Charleston, WV 25301
304-344-8290
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R. Glenn Vawter, P.E.

National Oil Shale Association
PO Box 3080
Glenwood Springs, CO 81601
970-389-0879
natosa@comcast.net

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) | |
| | | | | Marcellus Resource Assessment | | NA | |
| 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 |
| | | | 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 11



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 |

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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

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NATIONAL ENERGY TECHNOLOGY LABORATORY

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) | | 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 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) | | | Microwave heating Fractured media mode Oil shale catalysts | CO2 EOR 4 projects (2007) 5 projects (2008) |
| | Resource Character. | Subsalt Seismic Modeling (2007) | | 4 | Marcellus Resource Assessment | | 6 |
| HPHT Resources | Drilling | 1 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 | 2 Ecological Impact of Oil and Gas Activities (EIOG) Environmentally Friendly Drilling (2008) | | | EIOG Low Impact Roads (2007) | 3 |
| | 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 |

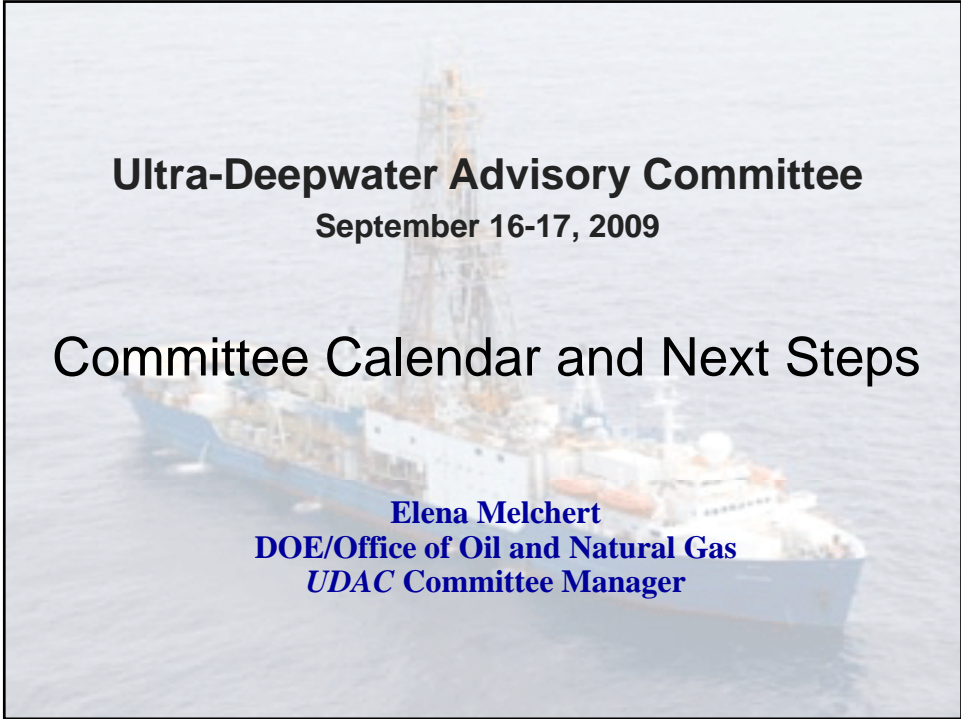
Technology Focus Areas

RPSEA-administered projects

Complementary projects

NATIONAL ENERGY TECHNOLOGY LABORATORY

Attachment 12



Ultra-Deepwater Advisory Committee

September 16-17, 2009

Committee Calendar and Next Steps

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

Ultra-Deepwater Advisory Committee

- **Committee Calendar**
 - **September / October: ad hoc Review Subcommittee meetings**
 - **October 6, 2009, draft report to UDAC Committee Manager**
 - **October 14, 2009, 8am-5pm, 12th UDAC Meeting in Los Angeles**
 - **October: Editing Subcommittee meets to prepare final report of UDAC comments and recommendations**
 - **October 20, 2009, Editing Subcommittee sends final report to the Committee Manager for distribution to the UDAC members**
 - **October 22, 2009, 1:00 pm EDT, 13th UDAC Meeting, Teleconference in Washington, DC to vote on Editing Subcommittee report**
 - **October 23rd, Chair delivers UDAC final report of comments & recommendations to the Secretary of Energy**

Ultra-Deepwater 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.

Ultra-Deepwater Advisory Committee

- **Next Steps: October 14, 2009 UDAC 12th Meeting**
 - Review Subcommittee Chairs present comments, findings and draft recommendations at UDAC meeting in Los Angeles on October 14, 2009.
 - UDAC 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.

Ultra-Deepwater Advisory Committee

- **Next Steps: October 22, 2009, 10:00 am EDT**
 - Teleconference in Washington, DC
 - UDAC votes to accept Editing Subcommittee report
- **Next Steps: October 23, 2009**
 - UDAC Chair delivers final report to the Secretary of Energy

