

## Unconventional Resources Technology Advisory Committee

July 25, 2007

I hereby certify that this transcript constitutes an accurate record of the Unconventional Resources Technology Advisory Committee meeting held on June 22, 2007 at the Sheraton Crystal City Hotel Arlington, Arlington, VA.

  
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Sally G. Zinke, Chair  
Unconventional Resources Technology Advisory Committee

7/25/07  
(Date)

# **Unconventional Resources Technology Advisory Committee**

## **Minutes of Meeting of June 22, 2007 Sheraton Crystal City, Arlington, VA**

### **Executive Session**

Bill Hochheiser, the Committee Management Officer (CMO), welcomed the Unconventional Resources Technology Advisory Committee (hereafter referred to as the Committee) at 8:15 a.m. on June 22, 2007. Bill noted that he shared the CMO responsibilities with Elena Melchert but, although she was not able to attend the meeting, she sent her regards to the Committee members. The Agenda for the meeting and Committee Member Sign-in sheet are provided as Appendix 1 and Appendix 2, respectively.

After appointment and administration of Oath of Office for special Government employees, the Committee was briefed on conflict of interest statutes and the regulations related to ethical conduct for executive branch employees, specifically, special Government employee (SGE) participation in Advisory Committee activities. Sue Wadel of the Department of Energy, Office of the General Council provided the briefing to the group. The legal briefing concluded at 8:30 a.m.

*[Ms. Wadel's talking points are in Appendix 3.]*

### **Welcome & Introductions**

Bill Hochheiser then introduced Deputy Assistant Secretary, James Slutz, the Committee Designated Federal Officer (DFO), who convened the meeting at 8:35 a.m.

*[See Appendix 4 for Mr. Slutz's slide presentations.]*

Mr. Slutz's comments set the stage for the Committee's duties as mandated by the Energy Policy Act of 2005 (EPAAct). The legislation specifically required that the Committee review and develop recommendations on the Unconventional Resources Technology Sections of the Draft Annual Plan (hereafter referred to as the Plan) for the Ultra Deepwater and Unconventional Resources Technology Research Program as advice to the Secretary of Energy in his development of the final Annual Plan.

Mr. Slutz then explained the urgency associated with the Committee's responsibilities, and the requirement for adherence to a very tight time schedule. Specifically, the Committee must complete its comments and recommendations on the Plan by the conclusion of the second meeting, scheduled for July 25, 2007 in Houston, Texas. He recognized the formidability of accomplishing this task in such a short period of time, and, accordingly, he thanked the members in advance for the dedication and hard work that is going to be required on their part to achieve this goal.

He stated that the purpose of the meeting was to establish a course of action that will ultimately lead to the production of the Committee's comments and recommendations

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on the Plan. Each member must review the Plan and compile findings and recommendations, and the group must produce a final document encompassing all member's views. A consensus of opinion is desired but not required. Minority viewpoints will be accommodated. It is the responsibility of the DOE to take appropriate action on the Committee's recommendations, and strong weight will be given to the Committee's considered opinions in light of the fact that the Committee represents a unique group of experienced and distinguished experts in oil and natural gas resources and pertinent related areas of interest.

The Committee was urged to be mindful of the fact that the Plan must be viewed in the context of a 10 year timeframe, although many of the specific project areas identified in the current Plan will apply only in the coming year or two. The EAct requires Advisory Committee review of each year's progress and Annual Plan, therefore this review is not a one-time effort but rather an ongoing responsibility. Also, the Committee is instructed to distinguish the two major, and significantly different, elements of the Plan: the consortium administered plan, and the NETL complementary research plan. There is to be no duplication of effort.

Some general guidance was also provided to the Committee: focus on the big picture, do not attempt to rewrite the Plan but rather advise on its strengths and weaknesses; consensus is good but not required.

The agenda for the meeting had been carefully structured to maximize the efficient use of time. He explained that the morning would be dedicated to reviewing the background of EAct Section 999, and to review the details of the Plan. Then, the afternoon would be dedicated to a facilitated discussion designed to seek out the views and opinions of the Committee members and to identify strengths and weaknesses of the Plan. Mr. Slutz explained that the expected deliverable from the afternoon session should be an action plan for achieving the ultimate goal of developing the final Committee recommendations. He reminded the Committee that their comments and final recommendations to be approved at the end of the next meeting are specifically required by the EAct, and will be published in the Federal Register with the Annual Plan.

The Committee was also asked to address some strategic questions about the Plan including:

- Does the Plan as a whole represent the best approach for utilizing the R&D funds available?
- Are the Plan's goals and objectives appropriate? Specifically, do they comply with the intent of EAct 2005, Section 999? Are they achievable yet challenging? Do the annual activities work toward long-term goals?
- Are the proposed R&D themes appropriate? Are they within the constraints of the expected budget? Is there sufficient flexibility in the Plan?
- Is the solicitation process appropriate? Is it fair, competitive, and transparent?

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The introductory comments and discussion concluded at 9:20 a.m. Brad Tomer, Director, Strategic Center for Natural Gas and Oil, with DOE's National Energy Technology Laboratory (NETL) was introduced for the next presentation.

### **Overview of Draft Annual Plan**

*[See Appendix 5 for Mr. Tomer's slide presentation.]*

An overview of the NETL organization was presented, highlighting the structure and reporting lines within the DOE followed by a summary of its scope of responsibilities, employees, and operating locations. A brief history of the Strategic Center for Natural Gas and Oil was reviewed noting that its focus was on supporting the oil and gas industry featuring a collaborative approach involving cost shared partners with industry, other federal agencies, national labs, and universities. This very successful program has generated significant benefits to the nation's economy, environment, and national security.

The provisions of EAct and its broad oil and gas implications were presented, including the three major elements of:

- Funding for the traditional oil and gas program as stipulated in Section 865;
- Providing funds to the Methane Hydrate program under Section 968; and
- Subtitle J, Section 999 which deals with Ultra-Deepwater (UDW) and Unconventional Natural Gas and Other Petroleum Resources

Section 999 provides for annual funding of \$50 million for a period of 10 years through the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund (Fund), and directs two major activities:

1. a consortium managed research, development, demonstration, and commercialization program associated with UDW, unconventional resources, and small producers; and
2. an NETL-managed complementary oil and gas research program

Major current activities within NETL were reviewed, which included the Stripper Well Consortium and Resource Assessment Programs directed by NETL for the benefit of stripper well producers. Specific NETL achievements presented included novel developments in drilling completion and stimulation operations, enhanced oil recovery programs, and advanced geological diagnostics and imaging systems. Other programs

presented included: the Deep Trek program, Microhole Technologies Program, the Oil & Gas Environmental Program, and the Methane Hydrate Program.

Mr. Tomer then shifted to the provisions to Section 999 regarding the award of a competitive contract to a qualified program consortium, and the mandated distributions from the Fund.

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In January 2007, NETL awarded the contract to the Research Partnership to Secure Energy for America (RPSEA). Accordingly, RPSEA will carry out research pursuant to the Secretary's Annual Plan. It will issue research project solicitations, propose project awards to NETL, and disburse research funds to the project performers. Ultimately, however, the Secretary of Energy is accountable for the overall execution of the Annual Plan.

The RPSEA Plan was submitted to NETL in April 2007. This Plan was based on inputs from numerous sources featuring RPSEA-coordinated member forums and numerous meetings with NETL.

NETL finalized the Plan incorporating RPSEA's recommendations, established priorities, and integrated NETL's complementary plan. The Plan was submitted to the DOE in May 2007, and distributed to the Committee on June 12, 2007.

Next, Mr. Tomer presented the NETL complementary R&D program. The NETL program will concentrate on unique high-value, non-duplicative work within the scope of EAct Section 999. The broad focus will be on long-term fundamental research applicable to oil and gas, featuring sound environmental principles. The specific technical areas under consideration include drilling under extreme conditions, the broad environmental impacts of oil and gas development, enhanced and unconventional oil recovery, and resource and technology assessments. As with all NETL programs this too is subject to annual merit review by an independent technical advisory group.

NETL will also provide planning and analysis support for the Section 999 program including coordination of benefits and impact analysis of the programs. Ultimately, NETL will finalize a methodology for determining the value of domestically produced gas/oil and royalty collections and other benefits based on these EAct-driven investments.

The presentation concluded at 10:10 a.m. and after a coffee break the meeting reconvened at 10:25 a.m.

### **RPSEA Unconventional Resources Plan**

Mr. Slutz introduced Mike Ming, RPSEA president, who presented an overview of the RPSEA organization and the scope of its activities. After this introduction, Mr. Slutz, the DFO, announced that he was called away from the meeting on business and that Bill Hochheiser would act on his behalf as the Designated Federal Officer until his return.

*[See Appendix 6 for Mr. Ming's slide presentation.]*

The presentation began with a brief review of RPSEA's structure. RPSEA is a 501(C)(3), nonprofit organization having been competitively selected by the DOE as the Section 999 Consortium Manager. RPSEA is currently made up of 108 members, and growing. Its members include oil and gas producers, service companies, leading universities involved in oil and gas exploration and production, associations, and local and state governmental representatives.

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RPSEA is structured in line with the financing structure mandated in Section 999. The key groups include the offshore and onshore groups with small producers being a subset of the onshore group. Additionally, there are support groups that encompass the administrative functions and overall guidance is given through the President's office who answers to the Board of Directors. The Board is made up of representatives from private industry, leading universities, trade associations, non-profit research organizations and Native American organizations.

RPSEA has internal committees to manage mid-term and longer-term R&D program management. RPSEA's Strategic Advisory Committee is at the Board and president level, while the next level, the Onshore and Offshore RPSEA operating divisions each have Technical and Program Advisory Committees. Finally, there is an environmental advisory group that advises both the onshore and offshore divisions.

The RPSEA is structured to accommodate the advice of a broad range of members and subject matter experts. Much of the planning work in RPSEA is derived from the direct input of their members through numerous forums that are conducted to openly discuss issues and fruitful areas for RPSEA endeavors. Since October 2006, 12 forums have been conducted, each one being hosted by a university and focused on specific promising areas for R&D consideration.

Subjects for the forums included diverse areas such as wellbore integrity and environmental topics, seismic E&P, autonomous intervention for deepwater operations, tight gas, shale gas, coal bed methane (CBM), problem identification, produced water, small producers, vortex induced vibrations, flow assurance, unconventional plays, research needs for Appalachian basin small producers, and seafloor engineering.

The Plan submitted to NETL was unanimously adopted by the RPSEA board and reflects inputs from several hundred experts that participated in various RPSEA activities involving RPSEA Advisory Committees, member forums, DOE road mapping workshops, and ongoing and frequent NETL consultations.

The general attributes of the Plan focus on three broad overarching areas of emphasis including: enhancing themes, enabling/cross cutting themes and science themes. But the Plan also recognizes future "grand challenge" opportunities that may offer groundbreaking, innovative technologies, and procedures have been developed to continually prioritize and rebalance the Plan's objectives as needed.

The Draft Annual Plan has a 10 year planning horizon, and the annually updated draft will be the primary tool used to communicate the reassessed strategic program direction in the near-term.

The RPSEA Plan has eight major exploration- and production-related themes, including four UDW field types, three unconventional onshore resource types, and one small producer challenge area. Each major theme is further detailed with component themes within its scope of operation.

The general objectives of the Plan outline the need for leverage on funding, personnel, equipment operations, and other resources with emphasis on integrated approach

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across all activities. RPSEA believes that research should be cumulative to mitigate risk and build upon itself. They plan a short- to mid-term timescale while carefully coordinating with the NETL program to avoid duplication. They will emphasize constant assessment of industry initiatives to avoid duplication and to focus on those projects that industry cannot or should not address. RPSEA also intends to avoid awarding many small scale projects which tend to dilute the potential for high impact results.

At 10:50 a.m. Michael Ming introduced Robert Siegfried, RPSEA's Manager of Unconventional Resources activity, who has previously been associated with Gas Technology Institute (GTI).

*[See Appendix 7 for Mr. Siegfried's slide presentation.]*

The scope of this program includes two major elements:

1. Unconventional natural gas and other petroleum resources exploration and production technology; and
2. Technology challenges of the small producers.

The unconventional resources program discussion began with an overview of the legislation which defines unconventional resources as those onshore resources currently economically inaccessible. In accordance with the statutory requirements, awards from allocations under this section will focus on the following areas:

Advanced CBM, deep drilling, natural gas production from tight sands, natural gas production from gas shales, stranded gas, innovative exploration and production techniques involved with the above-mentioned resources, enhanced recovery techniques, and environmental mitigation of conventional natural gas and other petroleum resources exploration and production.

The U.S. onshore and offshore technically recoverable natural gas resource base, as contrasted to the proven reserves, amount to 1,969 TCF but producing those resources is challenging due to the depth of the resources, many involving tight (low permeability) rocks, in less accessible geographies, and, in many cases, having been already heavily explored.

In order to optimize the effective utilization of the program funds, the initial focus of the unconventional program will concentrate on gas shales, tight sands, and water production issues involved with CBM. These focus areas resulted from the feedback and observations gained from the industry outreach forums that RPSEA conducted within the last year. As a result, it has been recommended that other unconventional resources including longer-term opportunities, crosscutting challenges with UDW (e.g., onshore deep gas) will be deferred for several years.

Several key forums representing involvement of hundred of independent producers, service companies, associations, consultants, and universities were instrumental in aiding RPSEA formulate the key elements of the Plan. The following chart provides details on the schedule of forum sessions conducted by RPSEA in the unconventional resources area.

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R&D Planning Event	Date	Description
RPSEA/New Mexico Tech Unconventional Gas Technology Workshops	Summer 2002	Five Workshops Conducted with Independents in Five Regions (San Juan, Permian, Mid Continent, Appalachia, Rockies)
National Petroleum Council 2003 Natural Gas Study	Study Conducted During 2002–2003	Comprehensive Evaluation of U.S. Natural Gas Resource Base Including Unconventional Gas
DOE-Sponsored Unconventional Gas Workshops	Summer 2005	Three Workshops Conducted with Independents (Houston, Denver, Pittsburgh)
RPSEA Member Forums	Conducted 2006–2007	Multiple Producer Meetings for Input for R&D programs and Program Structure
RPSEA Program Advisor Committee Meetings	Inaugural Planning Meeting February 2007	Planning Session Where Unconventional Resources and Technology Needs Were Identified
Preliminary Input to National Petroleum Council Global Oil and Gas Study	Study to be Completed Early 2007	RPSEA Participation on Technology and Unconventional Gas Teams

The primary themes that have been adopted as fruitful areas for R&D include:

- Gas shales
  - Rock properties/formation evaluations
  - Fluid flow and storage
  - Stimulation
  - Water managements
- Coal Bed Methane
  - Produced water management
- Tight sands
  - Natural fractures
  - Sweet spots
  - Formation evaluations
  - Well bore — reservoir connectivity
  - Surface footprints

Additionally it was decided that the available funds should be allocated as:

RPSEA Recommended Allocation of Unconventional Resources Technology Program Available Funds	
Area	Allocation
Existing Plays	45 Percent
Emerging Plays	45 Percent
Frontier Areas	10 Percent

The next discussion topic focused on small producers. As defined by the legislation, small producers are those U.S. companies producing less than 1,000 barrels of oil



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equivalent per day. In the small producer activity, Section 999 stipulates that awards from allocations under section 999H(d)(3) shall be made to consortia consisting of small producers or organized primarily of the benefit of small producers, and shall focus on the areas including:

- ▶ Complex geologies involving rapid changes in the type and quality of the oil and gas wells across the reservoir;
- ▶ Low reservoir pressures;
- ▶ Unconventional natural gas reservoirs in coal beds;
- ▶ Deep reservoirs, tight sands, or shales; and
- ▶ Unconventional reservoirs in tar sands and oil shales.

The amount of funding allocated for this activity amounts to \$3.5 million annually and RPSEA recommended that in order to maximize the benefit from the R&D activity, the existing mature oil and gas accumulations should be emphasized with the following objectives:

- Maximize the value of small producers' existing asset base;
- Leverage existing infrastructure;
- Return to production of older assets;
- Minimal additional surface impact;
- Minimize and reduce the existing environmental impacts; and
- Special focus on reducing costs and maximizing production.

Furthermore, the focus groups proposed that the most effective R&D topics should initially concentrate on:

- Water management
  - Produced water shutoff/minimization
  - Produced water treatment and disposal
  - Chemical treatment
- Improved oil and gas recovery
  - Enhanced recovery techniques
  - Reservoir life extension
- Reduce operating costs by focusing on production operations
  
- Reduce environmental impacts through plugging & abandonment and remediation

Additionally, under the umbrella of advancing technology for mature fields, field test programs for new technologies are recommended. Enhanced techniques will be developed for utilization of existing date, and developing sustainable best practices that are designed for the small producers.

The solicitation procedures will be designed so that proposals will be required to tie into a specific application of the proposed technology development including encouraging active small producer involvement and facilitating demonstration and commercialization.

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This is viewed as a key factor in the success of the program, i.e. that the path to application must be identified in the proposal.

The schedule milestone dates assume Plan approval in September, issuance of requests for proposals (RFPs) shortly thereafter, receipt of proposals in early November, and contract awards in late December.

The floor was opened for discussion at 11:35 a.m.

### Discussion

1. Several members questioned the level of involvement of the state oil and gas committees and RPSEA responded that the importance was recognized and that it was being pursued through the Interstate Oil and Gas Compact Commissions (IOGCC), who is a RPSEA board member. Also, RPSEA reported that meetings had been conducted with several state agencies recently and that they have been encouraging broader involvement of the applicable state agencies that oversee oil and gas exploration and production activities.
2. Members of the Committee raised an issue because there are no specific objectives for “other resources”, meaning crude oil, tar sands, and oil shale resources. In response, RPSEA indicated that the priorities had been developed consistent with the availability of R&D funds and feedback from the various industry forums. That does not mean that further development of oil resources is not an interest but rather the initial priority has been established in natural gas. It was agreed that this will be an area for further consideration based on the Committee opinions (to be discussed later during the day). It was also recommended that subsequent plans may likely include specific projects related to oil shale and crude oil resources in the Bakken Formation in North Dakota and the Barnett Field in the Fort Worth Basin.
3. To several members of the Committee the focus of the CBM program appeared to be focused on managing the water produced from the gas operation. However, the sequestration of CO<sub>2</sub> in coal seams should be included in future plans. This disposition for CO<sub>2</sub> has the potential to enhance the production of methane due to the higher affinity of CO<sub>2</sub> for absorption compared to methane. This subject would be discussed later to see if there was sufficient consensus to develop a recommendation to give higher priority to this evolving concept. Further, in the area of gas production from coal, some members of the Committee recommended that gas production from thin coal seams and multiple layer geologies should not be omitted. In response, RPSEA noted that thin coal seams were identified as a potential R&D topic, but only in the context of seeking better management of produced water. This subject would continue to be on the list of R&D avenues to be explored.
4. The general subject of technology transfer was discussed extensively. RPSEA indicated that this subject was covered in the solicitation process whereby each researcher was obligated to set aside 2 ½ percent of the contract award toward

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technology transfer. Many Committee members did not feel that this was adequate based on their collective experiences. Some members added that in addition to communicating results through the internet, workshops/forums were needed in order to get the word out and to offer operators the opportunity to discuss and question the new techniques. This was particularly true for the small operator segment that did not have technical staffs that could be assigned to assess the impacts. Leaving technology transfer to the researcher has not proven to be very effective in many cases and RPSEA was asked to consider a more active role in this area. RPSEA responded that the Petroleum Technology Transfer Council (PTTC) was a member of their organization and that they had extensive experience in this field and could be called upon to enhance the technology transfer planning activity. Also in response it was clarified that ultimately RPSEA was accountable for the success of the technology transfer activity.

5. A question was raised about the meaning of the boxed numbers presented in slide 8 that categorize the nine action blocks. After discussion, RPSEA clarified that these statistics indicated the second round member voting priority results for the various R&D project proposals but admittedly it was somewhat misleading. Therefore, RPSEA asked that Committee members ignore those statistics for the time being because the context of the analysis was omitted.
6. The level of staffing for the unconventional resource team was questioned and it was reported that currently the staff is limited to two full time people but that contractual arrangements are in place to increase staffing as needed from GTI.

The discussion period was concluded at 11:45 a.m., noting that additional time had been set aside for follow-up in the afternoon.

## Overview of EPL Act 2005 Section 999

*[See Appendix 8 for Mr. Hochheiser's slide presentation.]*

Bill Hochheiser outlined the Committee Section 999 obligations which set the stage for the afternoon session and reviewed the statutory obligations of the Committee as legislated in Section 999.

Mr. Hochheiser noted that the Committee membership was carefully designed to achieve the goals of the program. It is comprised of representatives from many diverse activities associated with the oil and gas exploration and production industry to represent various points of view, such as:

- Individuals with extensive research experience or offshore operational knowledge; and
- Individuals broadly representative of affected interests in ultra-deepwater oil and gas, including environmental and safety;

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He noted that: prohibited from participating were federal employees, RPSEA officers, and RPSEA Board members; aside from special Governmental employees, each member is expected to represent his or her particular interests in a biased manner; special Government employees have special requirements to recuse themselves from any discussion that will impact their personal finances; the Committee is prohibited against any involvement at the project level, and that the Committee should focus on higher level management process procedures, not specific projects or proposals.

Bill Hochheiser repeated Jim Slutz's earlier comments that July 25 has been set as the date for submission of the Committee's comments and recommendations, which in turn is set by the budget schedule. This requires that the annual report be released in a timely manner and published in the Federal Register as a prerequisite to having the budget's R&D funds released to allow initiation of the R&D projects.

Accordingly, it was clarified that at the next meeting in Houston, the Committee must produce a final set of written recommendations that eventually will become an appendix to the Annual Plan and will be published in the Federal Register.

The meeting broke for lunch at 11:55 a.m.

## **Unconventional Resources Technology Advisory Committee — Afternoon Session Facilitated Discussions**

Jim Slutz reconvened the group at 1:00 p.m. and announced the appointment of Sally Zinke as Chairman of the Unconventional Resources Technology Advisory Committee and Raymond Levey as Vice Chairman.

Following the announcement, Jim Slutz excused himself at 1:10 p.m. for other pending matters and Bill Hochheiser was recognized as the Designated Federal Officer.

Rich Scheer was introduced as facilitator for the afternoon discussions to establish a path forward and specifically how the Committee should proceed to achieve its objectives. It was reiterated that the primary objective for the Committee was to document their recommendations to the Secretary of Energy on the Plan presented by RPSEA and NETL. This final product was to be produced at the next Committee meeting, scheduled for July 25 in Houston. Thereafter, the Committee obligations for this year would be concluded. In 2008, the Committee would be called on once again to review and comment on the next annual plan.

The responsibilities of the Committee were outlined: the first afternoon session was designed to identify the areas of concern by the Committee and the action plan for followup and recommendations for further development would follow in the subsequent afternoon session just prior to closeout for the day.

## **Member Discussions**

The discussion themes were designed to solicit pointed feedback from the Committee in four key areas:

- 1) General reaction to the Plan including strengths and weaknesses
- 2) Assessment of the program goals and the ability of the Plan to achieve the stated goals
- 3) Observations on the technology challenges and R&D themes
- 4) Comments on the solicitation plans

A rough schedule had been proposed suggesting that the Committee devote two hours for discussion aimed at scoping out the reaction to the Plan and identifying areas of concern and then followed by one hour of planning how best to design a system for making specific recommendations on those concerns.

Most participants were complimentary of the overall Plan and felt it provided a comprehensive and balanced approach. Specific concerns and comments were discussed, and highlights of that discussion are presented below.

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<p><i>General reaction to the Plan including strengths and weaknesses</i></p>	<ul style="list-style-type: none"><li>• Many Committee members commented that the amount of funding for the activity appeared to be very limited considering the scope of work planned and compared to major oil company R&amp;D budgets. On the other hand, it was acknowledged that private R&amp;D program results were rightly owned by those investing companies and that dissemination of that information often took years. Hence, there was a real need for a coordinated R&amp;D program for the benefit of the entire industry, particularly for the small operators.</li><li>• Efforts should be made by NETL to confirm that their R&amp;D program was not duplicative of parallel industry efforts.</li><li>• It was suggested that the Plan should raise the priority given to crude oil in addition to natural gas as it was believed to be a very fruitful area for exploration and production.</li><li>• An important criteria for awarding projects should be the potential for utilizing its results over a wide range of potential applications as apposed to a project whose end product could logically only be applied in a very few number of geologies/wells.</li><li>• The R&amp;D program seemed to exclude exploration-related R&amp;D, in favor of production related issues. Inclusion of the exploration activity was recommended.</li><li>• The impact of the R&amp;D programs on workforce development should be highlighted as an important area for the future growth of the industry. With the current high oil prices, oil and gas technical manpower shortages were becoming an industry-wide issue.</li><li>• Regulatory issues deserve more attention in that many jurisdictions imposed restrictions on water quality, well spacing, and other important operational matters and that many of these issues could be addressed through some well thought out R&amp;D programs.</li><li>• The geographical emphasis of the Plan was discussed because it excluded the resources and contribution of California and other west coast states. Although California is the third largest U.S. oil and gas producer, it was disappointing to some members to see that this significant contribution appeared to be overlooked. Therefore, the Plan should be designed to appeal to broader geographical areas with in the United States.</li><li>• Some members observed that trying to get agreement of a large group with diverse opinions would by its nature result in a “conventional wisdom” solution. Novel new concepts are not likely to survive in this type of group process, therefore, some consideration should be given to how best to set aside some monies for new science applications. History has proven that significant results can be achieved from radical approaches to R&amp;D. This approach should not be overlooked.</li></ul>
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<p><i>Assessment of the program goals and the ability of the Plan to achieve the stated goals</i></p>	<ul style="list-style-type: none"> <li>• Goals should be established for oil reserves and production in addition to gas.</li> <li>• The stated volume targets appeared reasonable, some felt more bullish, i.e., the goal could be increased ten-fold.</li> <li>• Water availability may limit development of gas shales and tight sands resources in arid regions. Therefore, to focus attention in this area, specific numerical goals for water-related issues should be considered.</li> <li>• For the first several years of the program, some specific process-related goals should be established as an indicator of progress in the likely absence of having achieved specific reserve additions.</li> <li>• In response to a question whether the goals were to be updated based on the soon-to-be-released National Petroleum Council (NPC) study, it was felt that the goals would not be adjusted over time. Bill Hochheiser also commented that the NPC report would be available on their web site on July 18.</li> <li>• Some consideration should be given to breaking down the goals established for reserve additions into two categories: existing and new wells.</li> <li>• The program goals should be broadened to encompass broader indicators, for example: employment, Gross National Product (GNP), and other economic indicators instead of limiting them to production or reserves. Furthermore, justification for proposed higher levels of R&amp;D could also be measured in terms of these broader indicators.</li> </ul>
<p><i>Observations on the technology challenges and R&amp;D themes</i></p>	<ul style="list-style-type: none"> <li>• Many Committee members felt that the technology transfer plan needed more elaboration coupled with centralized management and specific metrics. The methodology used by Bill Fischer of the NPC could be used as a model for establishing technology transfer metrics. Also, the 2 ½ percent allocation to technology transfer was judged to be insufficient. It was back calculated to amount to only \$15,000 to \$20,000 for the average R&amp;D project. Some members also felt that case studies were effective ways of communicating the features of the new technology applications. In response, NETL mentioned that due to the concerns expressed regarding the technology transfer program, they would issue a draft of the current technology transfer plan to the Committee members within the next week in order to solicit their comments on the plan prior to the next meeting. The Committee members welcomed that commitment. Ultimately, the goal of technology transfer is the “uptake” on the part of industry and the goals should be established accordingly.</li> <li>• On the subject of CBM, a number of points were raised. Regarding water production, it was suggested that with appropriate focused R&amp;D effort, the water quality issues could be turned into potential value added opportunities for re-use. In addition to water issues with CBM production, similar issues also exist with water produced in tight sands fractures. Furthermore, the potential for methane production from thin coal seams and multiple layer zones should not be overlooked because it could exceed the value of resolving CBM water related challenges. Finally, it was recommended that the R&amp;D program should maintain close communication with the DOE Carbon Sequestration Program as it relates to the potential to sequester carbon dioxide (CO<sub>2</sub>) in coal beds.</li> <li>• It was recommended that RPSEA should confirm with Texas A&amp;M to ensure that there was no duplication with their currently active CBM R&amp;D program.</li> </ul>

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<i>Comments on the solicitation plans</i>	<ul style="list-style-type: none"><li>• In order to enhance the effectiveness of the solicitation program, workshops should be utilized as a method of communicating the planned solicitations and how the program will be structured. This would increase the likelihood that meaningful responses would be received.</li><li>• Based on recent experience, consideration should be given to keeping the scope of the solicitation manageable, i.e. limit the scope and geography to a practical range, particularly as it may apply to small operators. The staged solicitation process was seen as a positive element because it offered the opportunity for lessons learned to be applied and for the program to evolve in a logical, measured fashion as opposed to a broad, all-encompassing “shot gun” approach. Steps should also be taken to reduce the turnaround time to a minimum. Exposing small operators to open offers for extended periods should be avoided due to financial concerns.</li><li>• Some members felt that small operators would be reluctant to make significant commitments in the solicitations due to their resource limitations but rather they would look for service companies to participate.</li><li>• The approval process for R&amp;D projects involved RPSEA making a recommendation followed by NETL approval. Both groups agreed to consider ways to streamline the process to shorten the evaluation time to expedite the actual R&amp;D activities.</li><li>• The solicitation should be designed carefully to ensure that there is sufficient transparency in the overall process to guarantee that the interests of the American public are always protected and given top priority. There are many pitfalls that can be avoided with careful planning.</li><li>• The solicitation process should be designed to encourage and accommodate unconventional thinking among the funded projects.</li></ul>
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### **Schedules and Path Forward**

At the conclusion of the afternoon session, the Committee established the following six Subcommittees and schedule:

#### **Six Recommendation Areas:**

##### **Technology Transfer (includes: Small Producer Response to Solicitation, and Uptake)**

Lead – C. Hall

Members – Lewis, Dwyer, Ancell, Frantz

##### **Regulations**

Lead – Carrillo

Members – Tew, Mosher, Bardin

##### **Water Management**

Lead – Rao



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Members – Falkner, Carrillo, Ancell, O'Bryan, J. Hall

### **Production Research Theme Content**

Lead – Cavens

Members – Sparks, Anderson, Conser, Bardin, Tew

### **Exploration Research Theme Content**

Lead – Julander

Members – Levey, Aminzadeh, Ames

### **Metrics (includes: Funding)**

Lead – Zinke

Members – Ames, C. Hall, Daugherty, Bardin, Aminzadeh

Memo: All Committee members were encouraged to submit their suggestions to the appropriate Subcommittee lead, irrespective of whether they were participants in the Subcommittee.

### **Schedule:**

7/6	Recommendations to subcommittee leaders
7/11	Compilation of list sent to subcommittees
7/13	Subcommittee conference call
7/17	Consolidated list sent to all
7/25	Meeting in Houston

The Committee discussions concluded at 3:45 p.m.

### **Public Comments and Adjournment**

At 3:45 p.m. Bill Hochheiser, the Designated Federal Officer, opened the meeting for public comment. As there were no comments, the meeting adjourned at 3:47 p.m.

Unconventional Resources Technology Advisory Committee

**Appendix 1  
Agenda  
Unconventional Resources Technology Advisory Committee  
June 22, 2007  
Sheraton Crystal City, Arlington, VA  
Ballroom A**

7:00 – 8:00	Committee breakfast	
8:00 – 8:30	Processing of Special Government Employees (SGEs)	
8:30 – 9:00	Registration	
8:30 – 9:00	Executive Session: Swearing-in of SGEs Ethics Briefing Counsel)	DOE HR) DOE General
9:00 – 9:15	Open Session: Welcome & Introductions	Jim Slutz Deputy Assistant Secretary)
9:15 – 9:45	Opening Remarks Review of Agenda Objectives of the Meeting Responsibilities of Members under FACA	Jim Slutz
9:45 – 10:30	Overview of Draft Annual Plan DOE Traditional Oil and Gas Program EPACT Subtitle J Section 999 Planning Process EPACT Subtitle J Section 999 Plan Including NETL Complementary Plan Q/A	Brad Tomer
10:30 – 10:45	Break	
10:45– 11:45	RPSEA Unconventional Resources Plan Q/A	Mike Ming Bob Siegfried
11:45 – 12:00	Overview of Section 999D Duties (review) Membership by EPACT category Section 999B(e)(2)(B) and (e)(3) Q/A	Bill Hochheiser
12:00 – 1:00	Executive Session: [Lunch] Appoint Committee Chairperson and Vice-chair	

## Unconventional Resources Technology Advisory Committee

1:00 – 4:00	Open Session: Facilitated Discussions	Rich Scheer & Sabine Brueske Energetics
4:00 – 4:30	Establish schedule and path forward	Jim Slutz Committee Chair
4:30 -5:00	Public Comments (prior request required)	
5:00	Adjourn	

Unconventional Resources Technology Advisory Committee

**Appendix 2**

**Unconventional Resources Technology Advisory Committee Attendees June 21, 2007**

Mr. Eugene L. Ames III	Petroleum Geologist and General Manager	Nordan Trust	San Antonio, TX
Dr. Fred Aminzadeh	President-Elect	Society of Exploration and Geophysicists	Tulsa, OK
Mr. Kenneth L. Ancell*	Petroleum Engineer	Ancell Energy Consulting, Inc.	Houston, TX
Mr. A. Scott Anderson	Energy Policy Advisor	Environmental Defense Fund	Austin, TX
Mr. David J. Bardin*	Of Counsel	Arent Fox LLP (retired)	Washington, DC
Commissioner Victor G. Carrillo	Commissioner	Railroad Commission of Texas	Austin, TX
Ms. Jessica J. Cavens	Geologist	EnCana Oil & Gas (USA)	Denver, CO
Mr. Russell J. Conser	Manager-GameChanger	Shell International E&P Inc.	Houston, TX
Mr. William S. Daugherty	Chairman and CEO	NGAS Resources, Inc.	Lexington, KY
Mr. James P. Dwyer	Director Drilling Applications, Engineering	Baker Hughes INTEQ	Houston, TX
Ms. Juliette A. Falkner (ABSENT)	Senior Policy Advisor	The Nature Conservancy	Arlington, VA
Mr. Joe Frantz	President and CEO	Unbridled Energy Company	Pittsburg, PA
Mr. Jeffrey D. Hall	Manager of Exploration/Exploitation	Devon Energy Corporation	Edmond, OK
Mr. J. Chris Hall	President	Drilling Production Co.	Torrance, CA
Mr. Fred C. Julander	President	Julander Energy Company	Englewood, Co
Mr. Fletcher S. Lewis	President	Fletcher Lewis Engineering, Inc/Rainmaker Oil & Gas	Oklahoma City, OK
Dr. Raymond A. Levey*	Director Energy & Geoscience Institute and Research Professor	College of Engineering University of Utah	Salt Lake City, UT
Dr. James A. Mosher (ABSENT)	Executive Director	North American Grouse Partnership	Williamsport, MD
Dr. Patrick L. O'Bryan	Technical Director Wells, North America Gas	BP America, Inc.	Houston, TX
Dr. Vikram Rao	Sr. VP, Technology	Halliburton	Houston, TX
Mr. Don L. Sparks	Chairman of the Board	Discovery Operating, Inc.	Midland, TX
Dr. Berry H. Tew	State Geologist and Oil and Gas Supervisor	State Oil and Gas Board of Alabama	Tuscaloosa, AL
Ms. Sally G. Zinke	Geoscience Manger	Ultra Petroleum	Englewood, CO

\*Special Government Employee

## **Appendix 3**

### **Ethics Briefing**

**Presenter: Sue Wadel**

## DEPARTMENT OF ENERGY

### Advisory Committee Ethics Law Summary

As a "special" Government employee (SGE), most Federal ethics laws and regulations apply to you. Given they apply to all Federal employees carrying out a wide variety of Government tasks some rules will inevitably be less relevant to your duties than others. Even so, your careful adherence to the rules should foster public confidence that DOE's decision-making processes are not tainted by improper influences. That is why Executive Order 12674 further cautions all employees to "endeavor to avoid any action creating the appearance that they are violating the law or the ethical standards." Some SGEs may have conflicts of interests; however, in most instances a waiver can be issued to cure the conflict and permit participation on the advisory committee.

#### **I. DISQUALIFICATIONS**

- A. Absent a specific written waiver or a regulatory exemption, a criminal statute bars your participation, in your Government capacity, in any particular matter, if you or any of the following individuals or entities whose interests are imputed to you, have financial interests in the outcome:
- Your spouse or minor child
  - A business partner
  - An organization with which you are employed or affiliated as an officer, director, trustee, or general partner.
  - An organization with which you are negotiating for employment or have an arrangement for future employment.
- B. Regulations also restrict your participation in matters affecting specific identified parties involving:
- Relatives or members of your household
  - Individuals or entities with whom you have (or seek) business or financial relationships
  - Entities your spouse, parents, or dependent children work for (or seek to work for) as employees, officers, directors, trustees, consultants, etc.
  - Entities you have served as an employee, officer, director, trustee, consultant, etc. within the past 12 months
  - Organizations in which you are an active participant -- *e.g.*, committee chair or spokesperson.
- C. Your financial disclosure report will be reviewed and you will be given specific guidance and a waiver, if appropriate. Questions about potential waivers of the criminal restrictions should be addressed to the Office of the Assistant General Counsel for General Law.

#### **II. MISUSE OF POSITION**

- A. Do not use or disclose non-public Government information.

- B. Do not use your public office for private gain (whether your own or another's).
- C. Do not use your official position or advisory committee title for any purpose other than in connection with your advisory duties.

### **III. REPRESENTATION**

- A. A criminal statute provides that:
  - You must not represent someone else before the Government, including DOE, on any specific party matter in which you have participated as a Government employee. This law also bars you from accepting fees from such representation done by others.
  - Additional restrictions apply if an SGE works for more than 60 days during a 365-day period. The Department does not anticipate that any advisory committee members will approach this 60-day limit.
- B. Another law bars you from serving as an agent of a foreign principal, as defined in the Foreign Agents Registration Act.

### **IV. RECEIPT OF GIFTS**

- A. Basic Rule: Do not solicit or accept gifts and favors from any "prohibited source" or if the gift is given because of your official DOE position. A "prohibited source" is any individual or organization who:
  - Seeks official action from DOE;
  - Does, or seeks to do, business with DOE;
  - Conducts activities regulated by DOE;
  - Has interests that may be substantially affected by the performance of your official duties; or
  - Is an organization the majority of whose members are described above
- B. Commonly invoked exceptions include permission to accept:
  - Benefits resulting from your non-DOE business or employment activities (or those of your spouse), when it is clear that the benefits have not been offered or enhanced because of your Government status
  - Gifts clearly motivated by family relationship or personal friendship
  - Items worth \$20 or less per occasion -- up to \$50 a year from anyone source.

Exceptions should not be abused.

Please call your Designated Federal Officer at \_\_\_\_\_ or Susan Beard or Sue Wadel, Office of the Assistant General Counsel for General Law at 202-586-1522.

THE WHITE HOUSE

WASHINGTON

January 20, 2001

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

SUBJECT: Standards of Official Conduct

Everyone who enters into public service for the United States has a duty to the American people to maintain the highest standards of integrity in Government. I ask you to ensure that all personnel within your departments and agencies are familiar with, and faithfully observe, applicable ethics laws and regulations, including the following general principles from the Standards of Ethical Conduct for Employees of the Executive Branch:

- (1) Public service is a public trust, requiring employees to place loyalty to the Constitution, the laws, and ethical principles above private gain.
- (2) Employees shall not hold financial interests that conflict with the conscientious performance of duty.
- (3) Employees shall not engage in financial transactions using nonpublic Government information or allow the improper use of such information to further any private interest.
- (4) An employee shall not, except as permitted by applicable law or regulation, solicit or accept any gift or other item of monetary value from any person or entity seeking official action from, doing business with, or conducting activities regulated by the employee's agency, or whose interests may be substantially affected by the performance or nonperformance of the employee's duties.
- (5) Employees shall put forth honest effort in the performance of their duties.
- (6) Employees shall not knowingly make unauthorized commitments or promises of any kind purporting to bind the Government.
- (7) Employees shall not use public office for private gain.



(8) Employees shall act impartially and not give preferential treatment to any private organization or individual.

(9) Employees shall protect and conserve Federal property and shall not use it for other than authorized activities.

(10) Employees shall not engage in outside employment or activities, including seeking or negotiating for employment, that conflict with official Government duties and responsibilities.

(11) Employees shall disclose waste, fraud, abuse, and corruption to appropriate authorities.

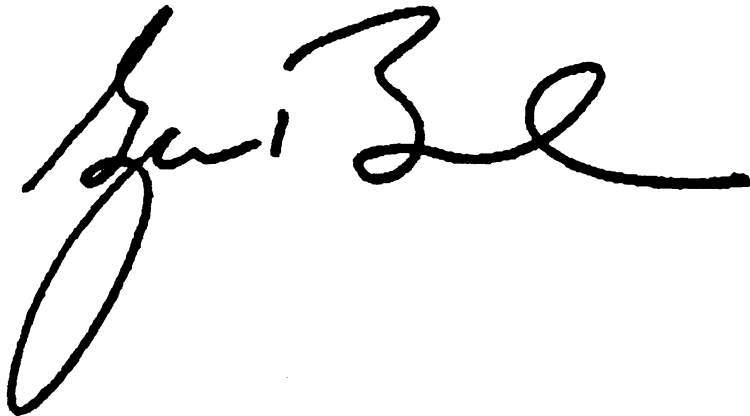
(12) Employees shall satisfy in good faith their obligations as citizens, including all just financial obligations, especially those -- such as Federal, State, or local taxes -- that are imposed by law.

(13) Employees shall adhere to all laws and regulations that provide equal opportunity for all Americans regardless of race, color, religion, sex, national origin, age, or handicap.

(14) Employees shall endeavor to avoid any actions creating the appearance that they are violating applicable law or the ethical standards in applicable regulations.

Executive branch employees should also be fully aware that their post-employment activities with respect to lobbying and other forms of representation will be bound by the restrictions of 18 U.S.C. 207.

Please thank the personnel of your departments and agencies for their commitment to maintain the highest standards of integrity in Government as we serve the American people.

A large, stylized handwritten signature in black ink, appearing to read "G. B. E.", is centered at the bottom of the page.

## **Appendix 4**

### **Welcome and Introductions**

**Presenter: James Slutz**

The background of the slide is a photograph of an oil well rig. The rig is a tall, white metal structure with a platform at the top, situated in a field of dry, yellowish-brown grass. The sky is a clear, light blue. The rig is the central focus of the image, with its base surrounded by some equipment and a small blue structure.

# **Introduction**

## **Unconventional Resources Technology Advisory Committee**

**James Slutz  
Deputy Assistant Secretary  
Office of Oil and Natural Gas**



# Role of the Committee

- **Role: Provide advice to DOE**
  - Provide recommendations on the development and priorities of the research program
  - Look at objectives of the initial annual plan within context of 10 year plan
  - Focus on Consortium-administered portion of the Plan, and also comment on NETL research and potential for duplication between NETL and Consortium portions
- **Guidance**
  - Focus on big picture. Don't rewrite plan but advise on strengths and weaknesses.
  - Consensus is good, but should not be forced.
  - Majority opinion with minority viewpoint is fine.

# Committee Objective

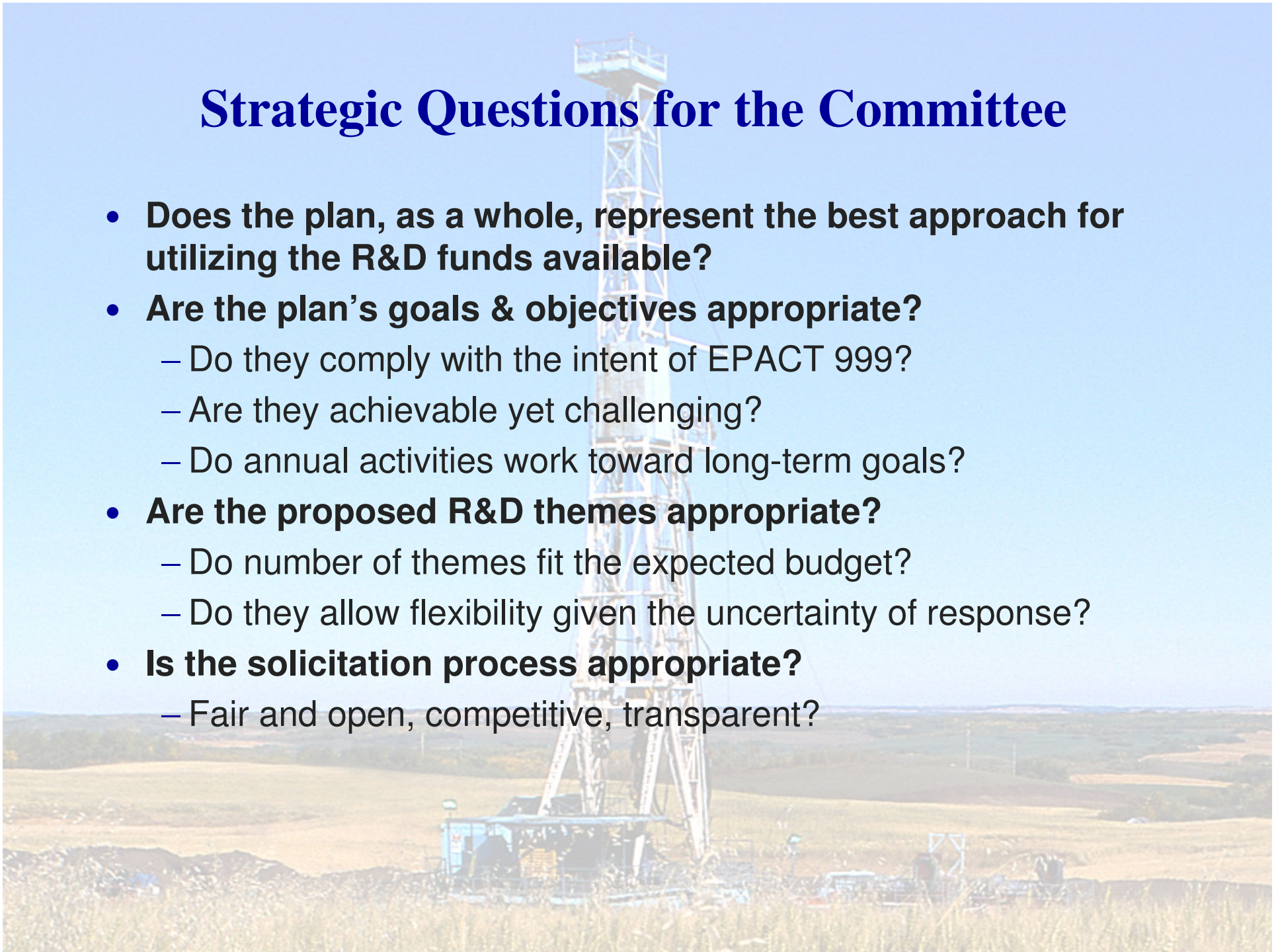
- **Objective: Finalize Committee advice by July 2007**
  - During Today's meeting
    - Speakers provide background presentations
      - Committee asks clarifying questions
    - Facilitated Committee Discussions
      - Initiate discussion on Plan
      - Develop process to complete Committee work
  - July Meeting in Houston
    - Complete and vote on final comments for inclusion in Plan to be submitted to Secretary





# Strategic Questions for the Committee

- **Does the plan, as a whole, represent the best approach for utilizing the R&D funds available?**
- **Are the plan's goals & objectives appropriate?**
  - Do they comply with the intent of EPACT 999?
  - Are they achievable yet challenging?
  - Do annual activities work toward long-term goals?
- **Are the proposed R&D themes appropriate?**
  - Do number of themes fit the expected budget?
  - Do they allow flexibility given the uncertainty of response?
- **Is the solicitation process appropriate?**
  - Fair and open, competitive, transparent?

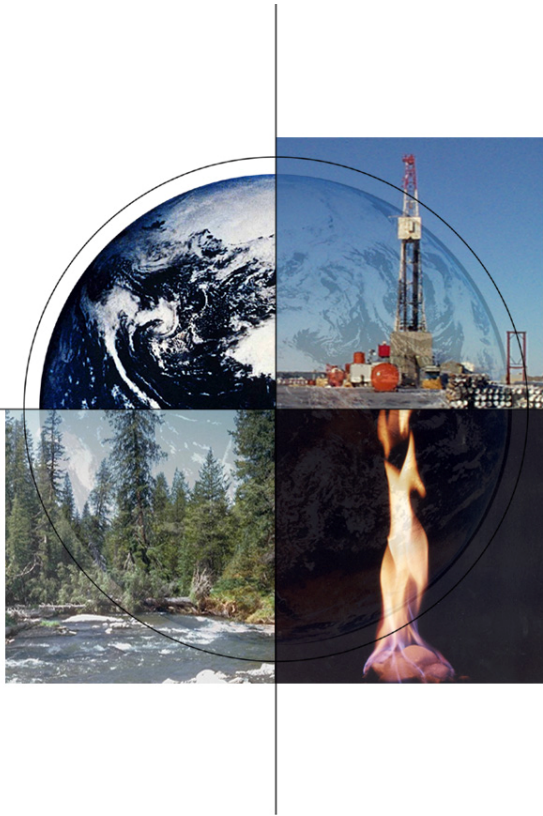


## **Appendix 5**

### **Overview of Draft Annual Plan**

**Presenter: Brad Tomer**

# US Dept of Energy Oil & Gas Research



*Brad Tomer*

*Director, Strategic Center for  
Natural Gas & Oil*

*EPACT Section 999 Federal  
Advisory Committee Meetings*

*June 21-22, 2007*

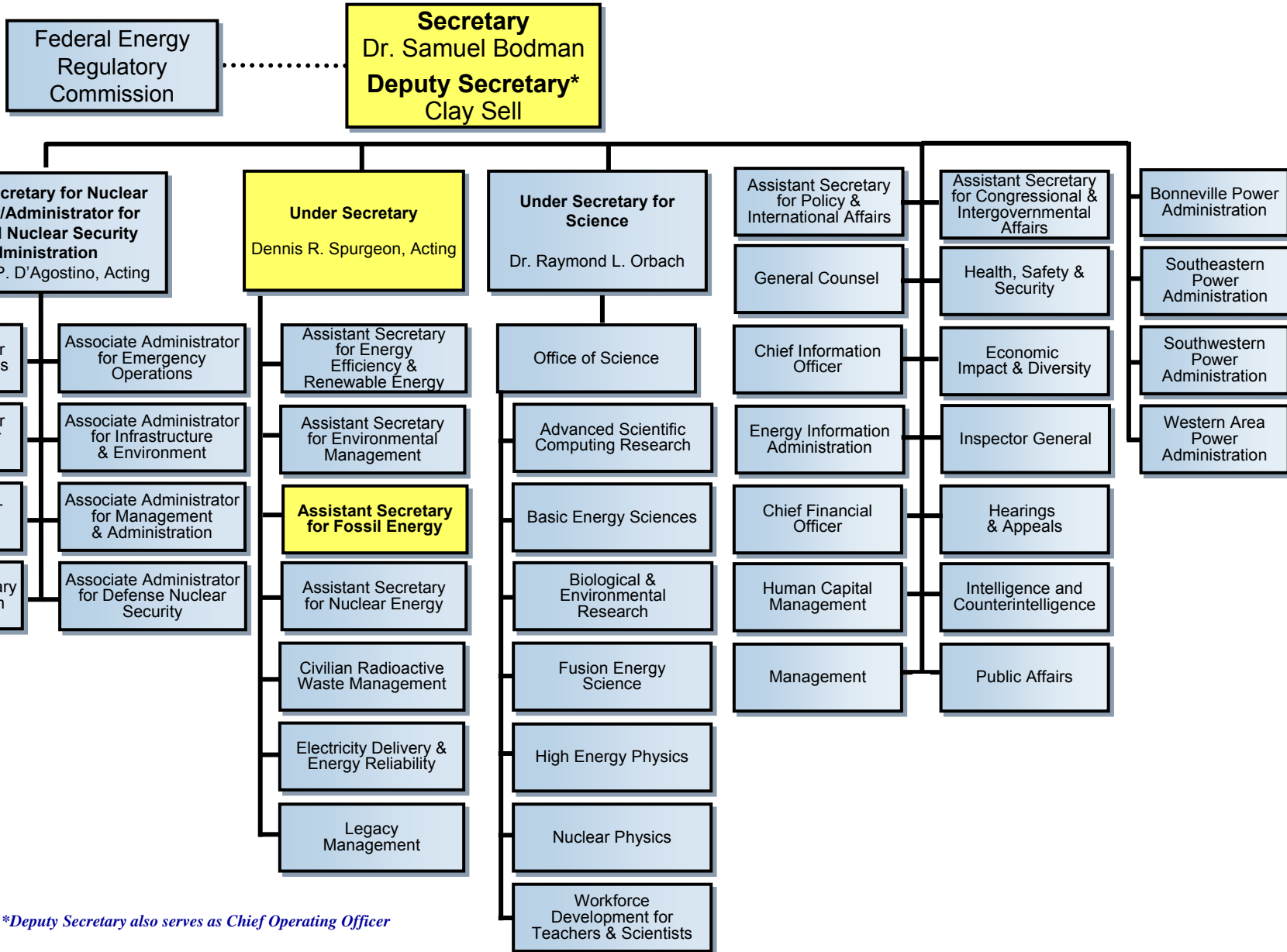
**National Energy Technology Laboratory**

**Office of Fossil Energy**





# Department of Energy



\*Deputy Secretary also serves as Chief Operating Officer

# National Energy Technology Laboratory

- **Only DOE national lab dedicated to fossil energy**
  - Fossil fuels provide 85% of U.S. energy supply
- **One lab, five locations, one management structure**
- **1,200 Federal and support-contractor employees**
- **Research spans fundamental science to technology demonstrations**



*Alaska*



*Oklahoma*



*Oregon*



*Pennsylvania*



*West Virginia*

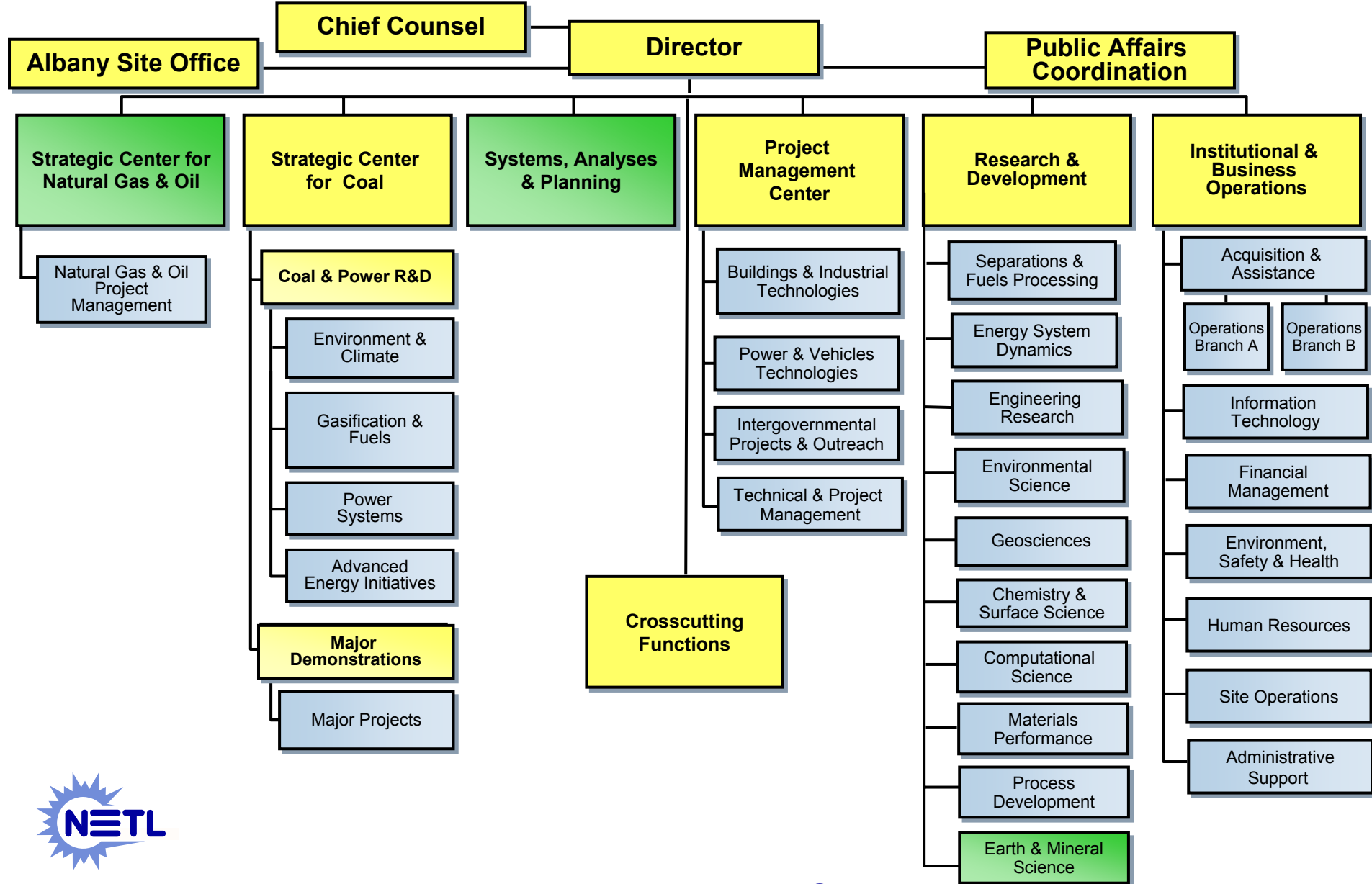


# Accomplishing Our Mission

- Implement and manage extramural RD&D
- Conduct onsite research
- Support energy policy development



# National Energy Technology Laboratory



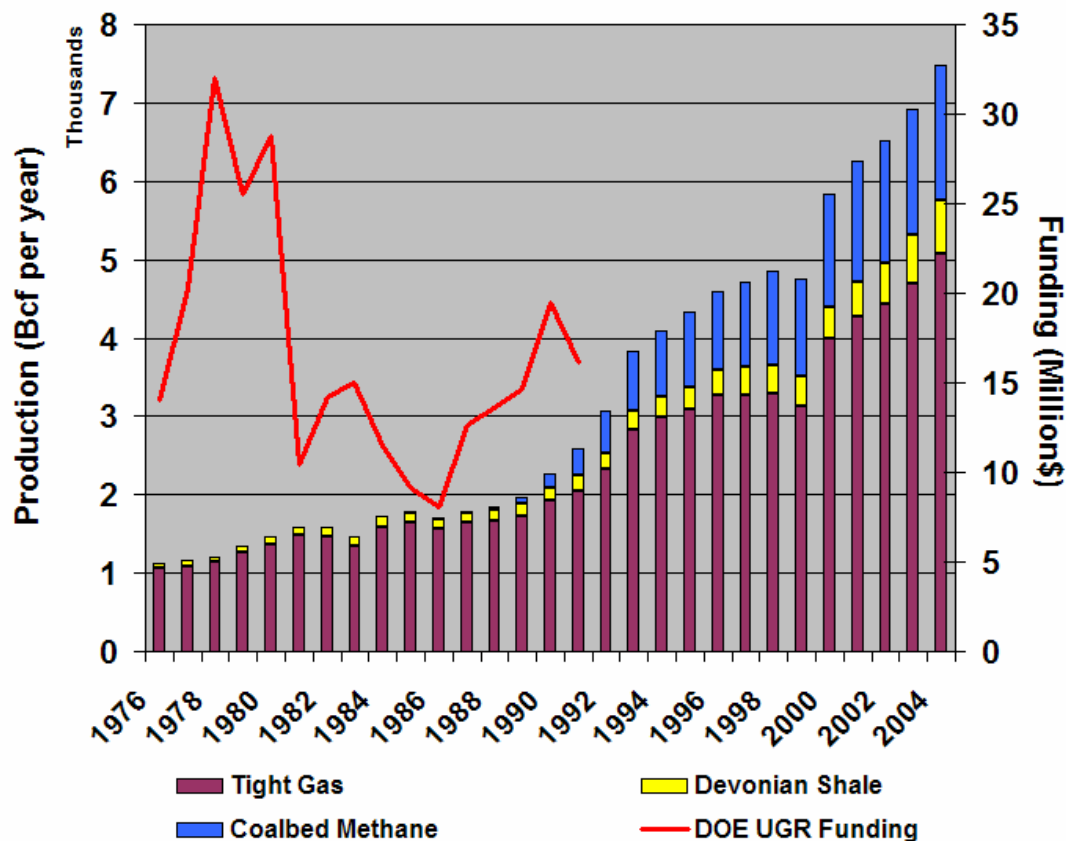
# Strategic Center for Natural Gas & Oil

## *History of Partnership Approach*

- **Implement R&D programs for DOE Office of Fossil Energy**
  - E&P; EOR; Methane Hydrates; Res Life Extension; Environmental
- **Careful planning with significant industry input**
  - Technology roadmaps, advisory committees, consortiums, merit/peer reviews
- **Cost-shared R&D conducted with partners**
  - Industry, federal agencies, national labs, universities
- **Historically modest oil and gas program budget**
  - \$65–\$80 million / year total
- **Extensive experience**
  - > 35 years in oil and gas R&D
  - R&D successes linked to:
    - 25% of U.S. gas production
    - 13% of US oil production



# Federally Funded Oil & Gas R&D Has Succeeded



For more than 35 years, DOE has supported the development of advanced oil and gas technologies.

DOE contributed to enabling unconventional/marginal resources to provide more than 25% of the nation's gas and 13% of the nation's oil production.

Significant benefits for the nation's economy, environment, and national security.

*"[The rapidly expanding coalbed methane market is the] direct result of the transfer of technology to independent producers through previous government research programs." - Craig Clark, CEO, Forest Oil*

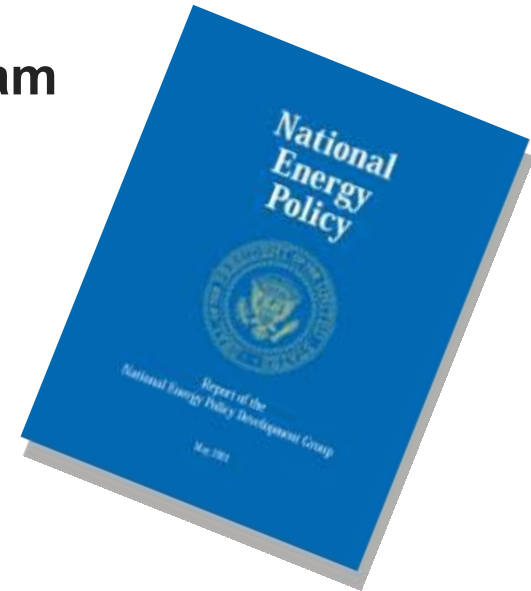




# Energy Policy Act of 2005

## *DOE Oil & Gas RD&D Items*

- **Sec 965 - DOE Traditional Oil and Gas Program**
  - DOE conduct a program of Oil & Gas RD&D
    - E&P; RLE; T&D; oil shale; environmental
- **Sec 968 – Methane Hydrate Research**
  - DOE-led multi-agency program
    - Resource, safety, environmental impacts
- **Sec 999 – Ultra-deepwater & Unconventional Program**
  - Royalty trust fund (\$50 million/year for 10 years)
  - Consortium for ultra-deep water; unconventional; small producers
  - Complementary research at NETL



# Traditional Natural Gas & Oil Technology Programs

*Budget (\$ million)*

	FY05	FY06	FY07	FY08*
Exploration and Production	23.0	17.8	0	0
Gas Hydrates	9.1	8.9	12.0	12.0
Infrastructure	8.1	0	0	0
Effective Environmental Protection	3.4	1.5	0	0
Congressional Directed Projects	0	4.5	0	0
<b>TOTAL – NATURAL GAS</b>	<b>43.6</b>	<b>32.7</b>	<b>12.0</b>	<b>12.0</b>
Exploration and Production	18.2	13.4	2.7	2.7
Reservoir Life Extension	5.8	5.9	0	0
Effective Environmental Protection	9.0	9.5	0	0
Congressional Directed Projects	0	2.9	0	0
<b>TOTAL - OIL</b>	<b>33.0</b>	<b>31.7</b>	<b>2.7</b>	<b>2.7</b>
<b>TOTAL – NATURAL GAS AND OIL</b>	<b>76.6</b>	<b>64.4</b>	<b>14.7</b>	<b>14.7</b>

*\*Initial House Marks*





# Oil and Gas E&P

## *Helping the Small Producer*

- **Stripper Well Consortium**

- Reduce premature well abandonment



- **Petroleum Technology Transfer Council**

- Assure full utilization of technologies

- **Resource Assessments**

- Inform industry & guide DOE R&D



# Stripper Well Consortium



- Industry-driven consortium established Oct. 2000
- Funded by NETL, NYSERDA, members (65)
- 80 projects funded thru 2007
- SWC - \$8.3 mil    Cost Share - \$6.1 mil
- Target: small independents
- Excellent cooperation among members
- Projects of 1 year duration
- Very “operator-friendly” process

- **Low-cost innovative technology to:**

- Increase production
- Reduce operating costs
- Reduce environmental footprint

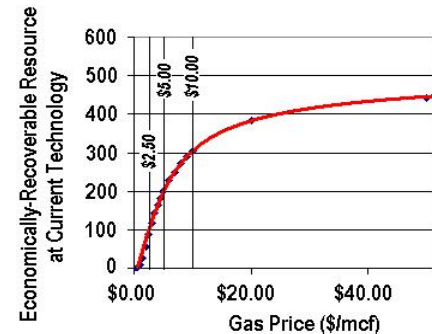
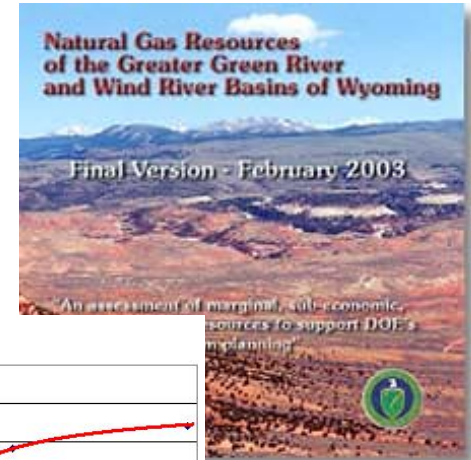
[www.energy.psu.edu/swc](http://www.energy.psu.edu/swc)



# Resource Assessments

## *To Inform Industry and Guide R&D*

- **Assessments conducted at NETL**
  - Expertise in measuring unconventional resource potential as a function of technology
  - Key Basins: Alaska North Slope, Greater Green River, Wind River, Uinta, Anadarko, Appalachia, Cook Inlet
- **Collaborative assessments**
  - Foundational studies of CBM, gas shales, tight sandstones & deep gas (with USGS, state surveys, universities, and industry)
- **Contributions**
  - Provide information to quantify the potential impacts / benefits of technology advance
  - Provide public domain data on the geology and remaining resource potential of key basins



# Oil and Gas Exploration & Production

## *Protecting the Environment while Lowering Costs*

- **Drilling, Completion & Stimulation**

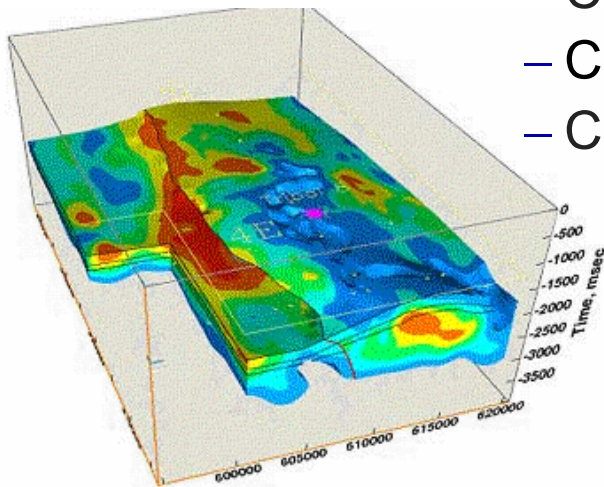
- Increase rate of penetration
- More durable tools, innovative concepts
- Enable Greater CT Drilling Efficiencies

- **Enhanced Oil Recovery**

- CO<sub>2</sub> Injection
- Conformance control
- CO<sub>2</sub> EOR Potential 43 billion barrels

- **Advanced Diagnostics & Imaging Systems**

- Improved characterization
- Advanced seismic for natural fracture detection and EOR (4D)





# Deep Trek Program

## *Tools for Extreme Environments*

- **Purpose**

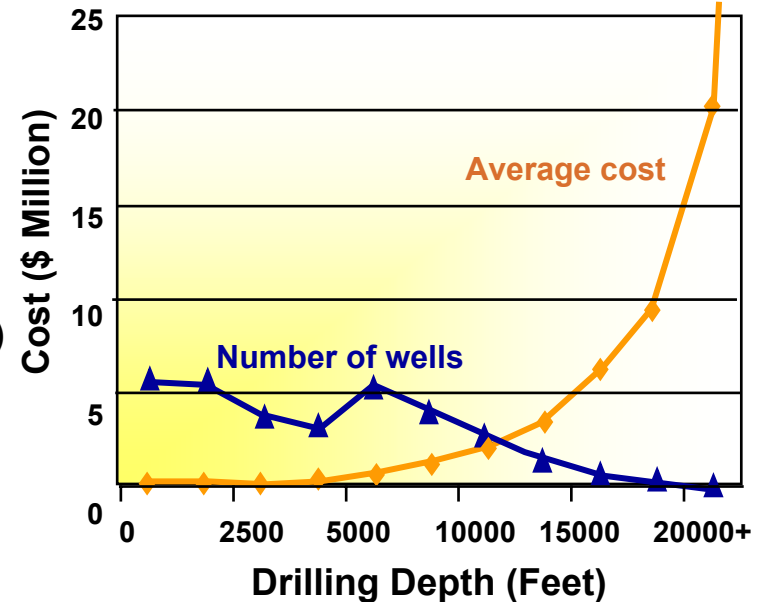
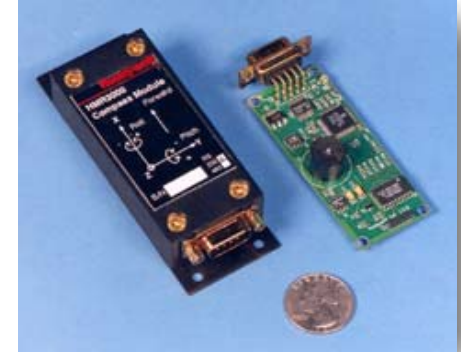
- Develop high-pressure / high-temperature materials and electronics
- Build family of deep drilling tools and sensors
- Demonstrate integrated deep drilling system

- **Projects**

- High-T electronics (Honeywell, GE, OSU, Giner, H-S)
- High-T / high-P MWD (Schlumberger)
- Super cement (CSI Technologies)
- Downhole vibration monitoring & control (APS Technology)
- Adv. bits & fluids benchmarking (TerraTek)
- HT Battery (Electrochemical)
- Downhole turbine generator ( Dexter Magnetics)
- Deep EM telemetry (E-Spectrum)

- **Program status**

- Roadmap workshop March 2001
- Project awards 2002, 2003, 2005 & 2006



# Microhole Technologies



*For High Efficiency  
Mature Field Development*



*For New E&P Imaging Paradigms*

- Will allow new wave of development drilling for mature fields based on drilling cost reductions approaching 50%
- Low environmental impact for improved sensitive area access
- New paradigms in “high-res” seismic imaging to reduce E&P risk



# Oil and Gas Environmental Program

**Technology and policy solutions for environmental barriers that limit domestic production**

- **Federal Lands Access**

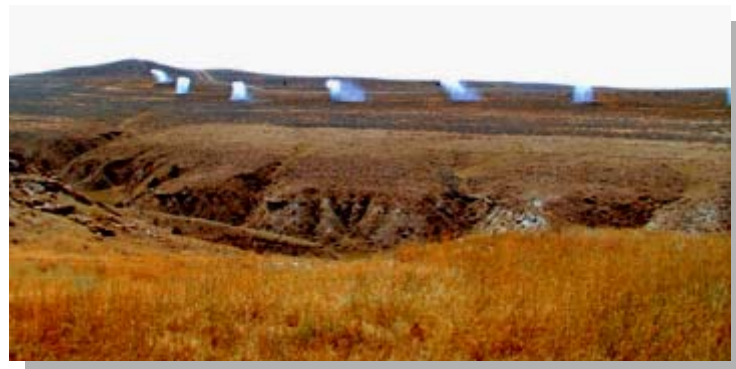
- Reduce permitting times
- Science-based stipulations

- **Coal Bed Natural Gas - Water Issues**

- Treatment technologies
- Scientific impact evaluation

- **Air and Water Emissions**

- Treatment technologies
- Measurement techniques
- Streamline permitting

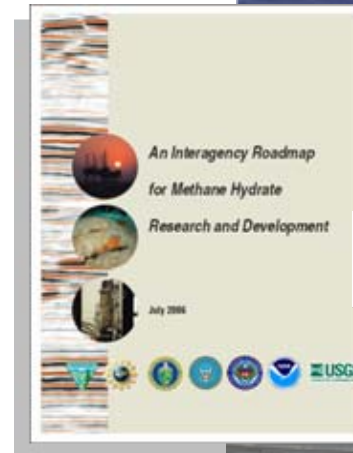
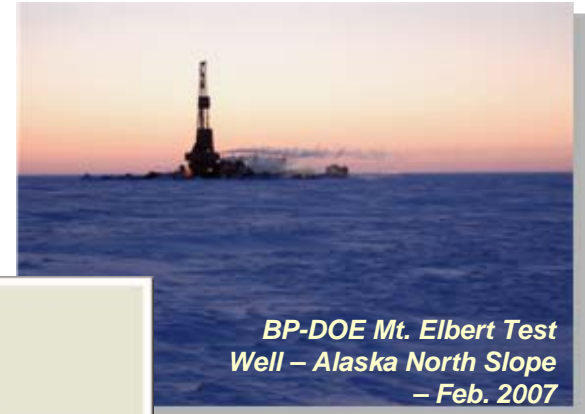


# Methane Hydrates

- **DOE-led interagency program**
  - Five-year authorization by EPACT 2005 Sec 968
  - Seven collaborating agencies
- **Huge potential resources**
  - 200,000 Tcf domestic gas-in-place

*If 1% can be rendered economic  
will double nation's supply of gas*

- **Program addresses**
  - Safety & seafloor stability
  - Global climate impacts
  - Future Resource Potential
- **Impacts**
  - Better informed ocean/climate policy
  - Potential new domestic gas resource
  - Global realignment of energy supply



PUBLIC LAW 106-193—MAY 2, 2000  
METHANE HYDRATE RESEARCH AND  
DEVELOPMENT ACT OF 2000





# Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Sec. 999B(j) *Program Review and Oversight*

- **National Energy Technology Laboratory, on behalf of the Secretary, shall ...**
  - 1) issue a competitive solicitation for the program consortium,
  - (2) evaluate, select, and award a contract or other agreement to a qualified program consortium, and
  - (3) have primary review and oversight responsibility for the program consortium, including review and approval of research awards proposed to be made by the program consortium.



# Section 999 Funding Distribution

## Allocations of Funding Amounts:

- 35% (\$14,963K) Ultra-Deepwater
- 32.5% (\$13,894K) Unconventional Resources
- 7.5% (\$3,206K) Small Producer Challenges
- 25% (\$12,500K) NETL Complementary Research

## Other Direction:

- 2.5% of each award for technology transfer
- $\leq 10\%$  (\$3,562K) RPSEA administration
- 5% (\$1,875K) NETL program review and oversight



# Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources

## *Program Administration*

- **NETL selected RPSEA to administer program**
  - Contract effective January 4, 2007
  - Research Partnership to Secure Energy for America
  - Non-profit corporation; >100 member consortium
- **RPSEA will:**
  - Carry out research pursuant to annual plan as approved by DOE
  - Issue research project solicitations
  - Make project awards
  - Disburse research funds to performers
- **NETL will:**
  - Manage the contract between RPSEA & DOE
  - Develop annual plan based on RPSEA input
  - Review/approve research awards made by RPSEA



# Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources

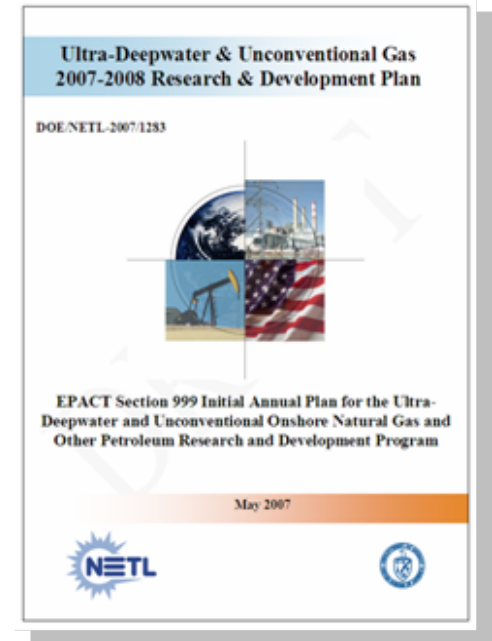
## Sec. 999B(e) *Annual Plan*

- Annual plan prepared by **Secretary of Energy**
- **Secretary solicits recommendations from:**
  - RPSEA in form of draft annual plan
  - Ultra-Deepwater & Unconventional Resources Advisory Committees
- **DOE consults regularly with RPSEA throughout process**
- **Transmit plan to Congress**
- **Publish plan in Federal Register**



# Draft Annual Plan Development

- **RPSEA submitted Draft Annual Plan on April 3, 2007**
  - Input from numerous sources
    - RPSEA Member Forums
    - Roadmapping by GTI under DOE contract
    - Numerous meetings with NETL
- **NETL developed complementary plan**
  - Internal working groups
  - External advisory panel
- **NETL developed overall plan**
  - Streamlined RPSEA recommendations
  - Established some priorities
  - Integrated NETL complementary plan
  - Circulated to RPSEA & HQ DOE for comment
  - Submitted current version to HQ on May 11, 2007



# Ultra-Deepwater Program Goals

Goal	Target Metric
Increase the size of the UDW resource base	Identify and discover 1% or more of the 50 billion recoverable BOE remaining to be discovered. This is the equivalent of one 500 MMBOE field or five 100 MMBOE fields (200:1 return on Program investment).
Convert identified resources into economic recoverable reserves	Add 100 MMBOE or more to the technically recoverable resource (40:1 return on Program Investment).





# Ultra-Deepwater R&D Themes

- **32 Themes identified by RPSEA to bridge technology gaps for the 4 field scenarios**
  - NETL reorganized into 33 themes
    - Combined common themes
    - Split out sub-themes in field types
  - 9 field-specific themes
  - 24 crosscutting themes
- **Themes were prioritized by NETL for purposes of solicitation groupings**
  - Solicitation 1: 16 themes (14 are crosscutting)
  - Solicitation 2: 13 themes (8 are crosscutting)
  - Solicitation 3: 4 themes
  - By end of July RPSEA will have specific project ideas identified based on themes which may slightly change prioritization.



# Unconventional Resources Program

<b>Goal</b>	<b>Target Metric</b>
Increase the size of the technically recoverable unconventional resource.	Add 30 TCF to the technically recoverable unconventional resource.
Convert technically recoverable resources into economic recoverable reserves	Convert 10 TCF of unconventional gas resource from technically recoverable to economic reserves.





# Unconventional Resources Program

Level of Field Development	Program Balance	Priority Gas Shales	Priority Coalbed Methane	Priority Tight Sands
Existing	45%	Fort Worth - Barnett	Appalachian	Green River/Uinta
		Appalachian	San Juan	South Texas
			Powder River	Appalachian
Emerging	45%	Permian	Uinta-Piceance	Appalachian
		Arkoma/Ardmore/Anadarko	Powder River	Piceance
		Illinois & Michigan		Uinta
Frontier Area	10%	Permian-Woodford	Illinois and Michigan	Western Oregon
		Green River	N. Mid-continent	Washington



# Unconventional Resources Program

- Technology challenges identified from multiple industry forums, workshops and studies held 2003-06
- Gas shales selected as top priority – most difficult technology challenges, least developed, greatest potential for near-term results
- Program to be balanced across emerging (45%), existing (45%) and frontier (10%) field development levels
- Two solicitations planned
- No significant changes from RPSEA draft



# Small Producer Program

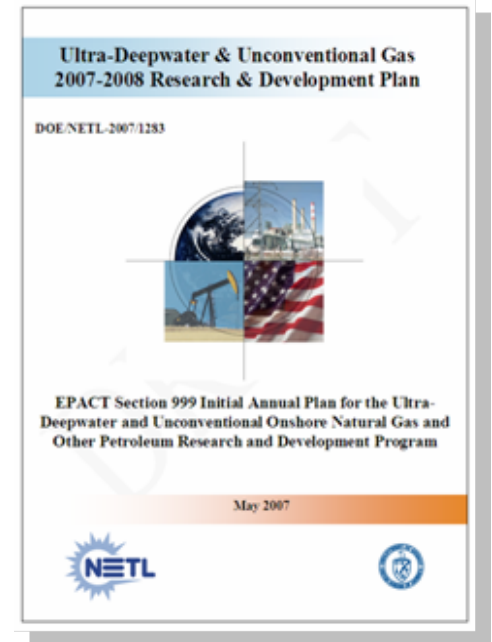
Goal	Target Metric
Add to the reserve base associated with mature fields operated by small producers.	Achieve a 10 to 1 return on R&D investment, in terms of the value of new reserves added to mature fields.

- **Program targets** *“advancing technologies for mature fields.”*
  - Managing water
  - Improving recovery
  - Reducing costs
- **Near term focus**



# NETL Complementary R&D *Program Philosophy*

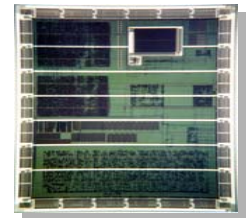
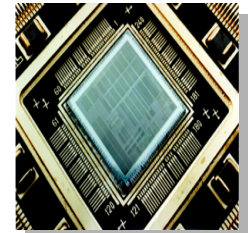
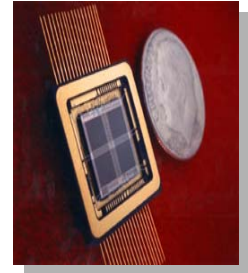
- **Conduct unique, high-value, non-duplicative work under EPACT 999**
- **Coordinate with RPSEA & traditional program**
- **Focus:**
  - Fundamental science
  - Long-term research providing basis for next-generation technologies
  - Unbiased environmental science
- **Technical areas:**
  - Drilling under extreme conditions
  - Environmental impacts of oil & gas development
  - Enhanced & unconventional oil recovery
  - Oil & gas resource & technology assessment
- **Conduct annual merit review**



# Drilling Under Extreme Conditions

## *EPACT 999 plan*

- **Ultra-deep single cutter Drilling Simulator (UDS)**
  - FY2008: UDS becomes fully operational
  - FY2012: Publish results of 8 studies of impact on ROP of different fluids as a function of P, T, and rock type
- **Novel drilling fluids**
  - FY2008: Initial nanofluid tests/characterizations
- **HP/HT electronics and sensors**
  - FY2008: Initiate work on HP/HT sensors, contacts, semiconductors and other electronic components
  - FY2012: Motor and control components and wireless silicon carbide electronics tested to 350°C
- **HP/HT materials**
  - FY2008: Benchmark tubular performance in HT/HP sour settings
  - FY2008: Investigate application of NETL High Interstitially Strengthened Steel (HISS) to HP/HT settings
  - FY2012: Complete materials development work initiated during earlier program assessments



# Ultra-deep single cutter Drilling Simulator (UDS)

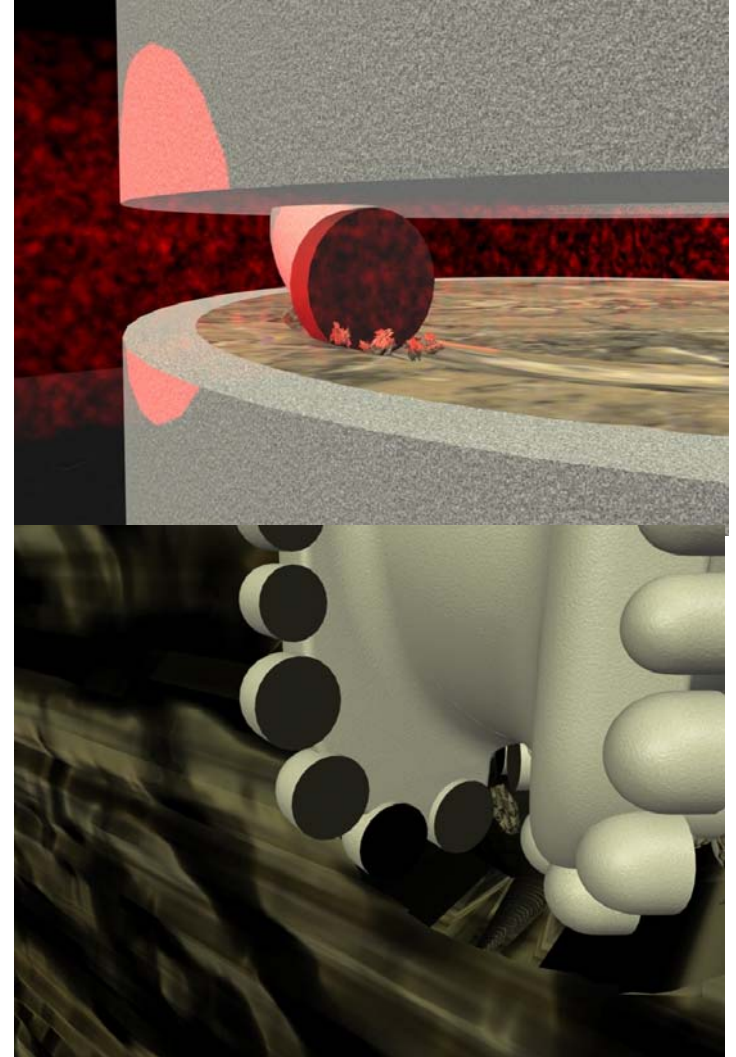
*Developed with TerraTek, a Schlumberger company, under DE-FC26-05NT42654*

- **One-of-a-Kind research facility capable of recreating bottom-hole drilling environments of ultra-deep wells**
- **Capability:**
  - Pressure up to 30,000 psi (2068 bar)
  - Temperature up to 481 °F (250 °C)
- **Operates on “real” drilling mud**
- **Visualization through X-Ray video system**
  - Images of cutting at down-hole conditions (i.e. HPHT)
  - Cutter and rock immersed in an optically opaque drilling fluid
- **Available for operation – April 2008**



# Degrees of Freedom in UDS Experiments

- **Cutter Type**
  - Material, Size, Shape, Back rake
- **Rock Type**
  - Seek analogs to formation rocks w.r.t. hardness, porosity, permeability
- **Drilling Fluid Formulation**
- **Drilling Fluid Hydrodynamics**
  - $\Delta P_{\text{nozzle}}$ ,  $T$ ,  $Re_D$ , Nozzle placement
- **Weight on cutter**
- **Cutter Speed**
  - Radial position, rotation speed
- **Pore Pressure Control**
  - $\Delta P_{\text{core}}$ ,  $P_{\text{confining}}$ , rock permeability

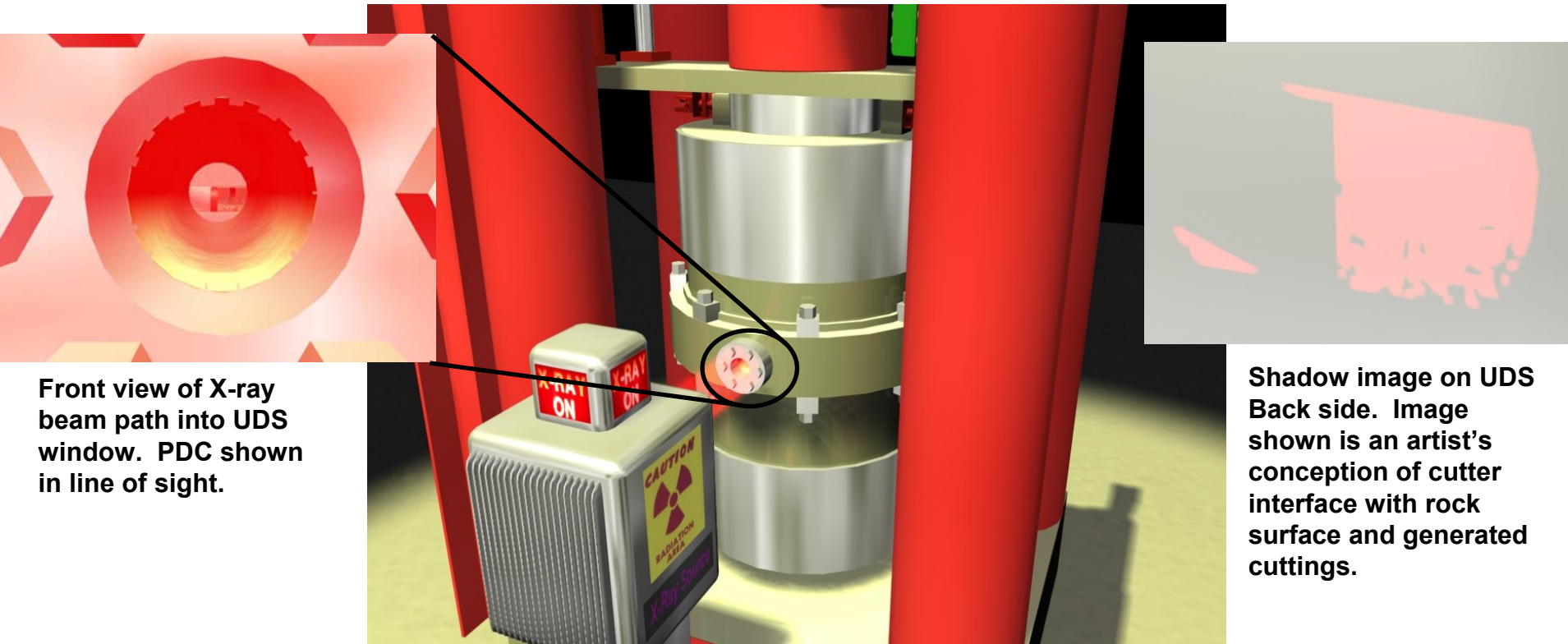




# Role of X-Ray Visualization

- **Visualization provides**

- Specifics on rock deformation & strain as cuttings form
- Shape of rock cutting as it forms
- Evidence of how test parameters (e.g. fluid properties) change cutting process



Front view of X-ray beam path into UDS window. PDC shown in line of sight.

Shadow image on UDS Back side. Image shown is an artist's conception of cutter interface with rock surface and generated cuttings.

# Examples of Future UDS Tests

- **Parametric Studies**

- Drilling Fluids (vary base fluid, weight, viscosity, etc.)
- Fluid Injection (nozzle placement, Reynolds number)
- Weight on Cutter and/or Displacement rate control

- **Fundamental Investigation**

- Seek out evidence of filter cake formation on rock during very small time increments (i.e. between cutter passes)
- Effects of fluid transfer between rock/wellbore
- Role of volume changes in rock phase
- Importance of particle size distribution of dissolved solids



# Enhanced and Unconventional Oil Recovery

## *EPACT 999 plan*

- **Reservoir Characterization**

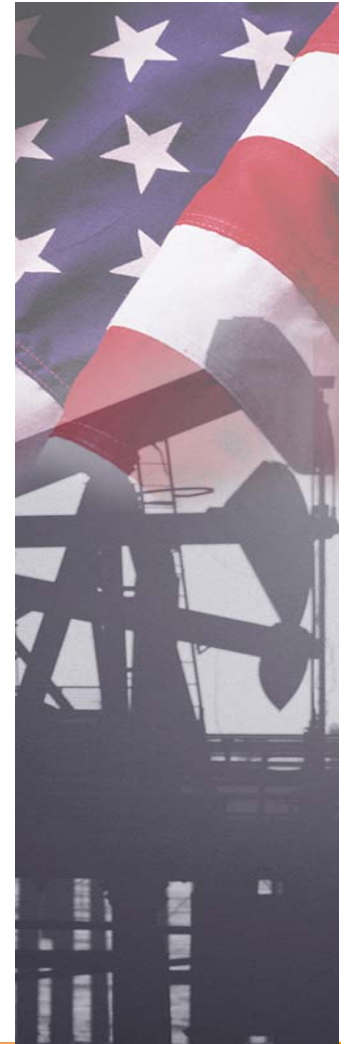
- FY2008: create reservoir characterization data archives from historic EOR and oil shale projects

- **New EOR Technologies**

- FY2012: develop new technologies for improving the mobility control of CO<sub>2</sub> floods
- FY2012: investigate new and novel thermal practices for heavy oil

- **Sensor and Catalyst Development**

- FY2017: progress on development of nanosensors for real-time in situ data collection
- FY2017: develop and test new catalyst for in-situ pyrolysis of oil shale



# Environmental Impacts of Oil and Gas Development

## *EPACT 999 plan*

- **Unbiased information for sound policy**

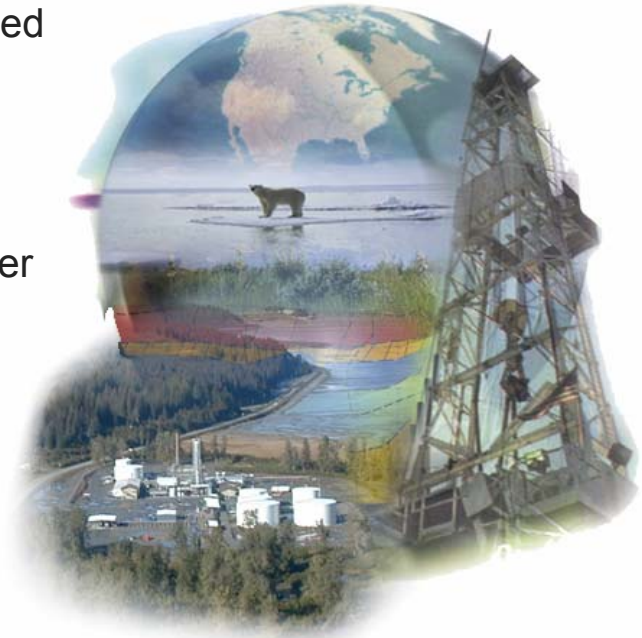
- FY2008: Initiate remote sensing studies of methane release to the atmosphere
- FY2012: Publish new models for air emission impacts from E&P
- FY2012: Report on ecological impact of E&P within selected watersheds within the Appalachian basin using

- **Managing produced water**

- FY2012: Complete scientific assessment of produced water impacts and treatment options in the Powder River Basin
  - Salt mobilization in CBNG drainage systems
  - LIDAR-based drainage capacity assessment
- FY2012: Deliver report evaluating alternative produced water management strategies

- **Oil Shale water-use minimization**

- FY2012: Provide refined upper and lower limits to water quality and quantity required to support oil shale production as a function of production method and rate



# Resource and Technology Assessments

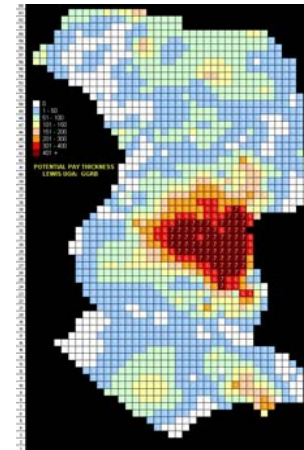
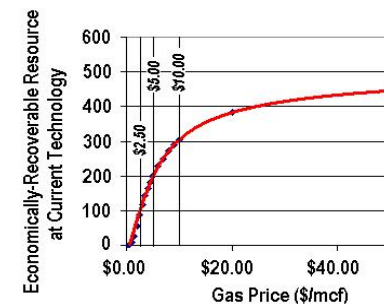
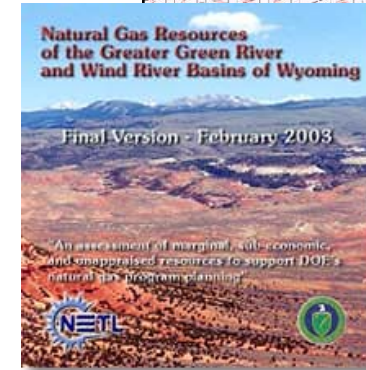
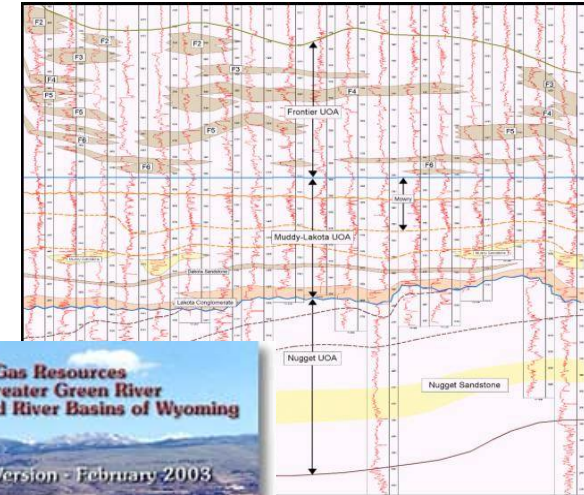
## *EPACT 999 plan*

- **Resource Assessment**

- FY2008: delineate most promising plays in the Appalachian basin (AB)
- FY2010: complete initial AB assessment on CD
- FY2012: complete 2<sup>nd</sup> round AB assessments
- FY2012: identify need for additional assessments

- **Technology Assessment**

- FY2008: document current state of advanced technology usage in the Appalachian basin
- FY2010: complete assessment of historical trends in advanced technology adoption in mature basins
- FY2012: develop capability for reliable modeling of technology impacts





# Planning and Analysis Support

## *EPACT 999 plan*

- **NETL Office of Systems, Analyses and Planning (OSAP)**
  - Coordinate benefits analyses
  - Collaborate with RPSEA to gather data
  - Design and complete analyses focused on federal lands issues, royalty collections and environmental impacts
  - Carry out microeconomic studies to examine impact of R&D program
- **Short-Term Objectives (through 2008)**
  - Develop baseline royalty collections metric methodology for Report to Congress
  - Ensure plan for adequate data collection from consortium awardees
  - Initiate industry data/statistics collection in support of management plan
  - Finalize methodology for determining value of domestically produced gas/oil and estimating increases in royalty collections and other benefits based on EPACT 999 investments



# Oil and Gas R&D Funding

Department of Energy  
*Office of Fossil Energy*

NETL

\$37.5 MM

FY07 \$14.7 MM  
FY08 TBD

\$12.5 MM

## Consortium Program

- ♦ Ultra-deepwater \$14.963
- ♦ Unconventional Gas \$13.854
- ♦ Small Producer \$3.206
- ♦ RPSEA administration \$3.562
- ♦ NETL oversight \$1.875

## Complementary Program

- ♦ Extreme Drilling
- ♦ Unconventional Oil and EOR
- ♦ Environmental
- ♦ Resource Assessment

## Traditional Program

- ♦ E&P
- ♦ Hydrates
- ♦ Environmental
- ♦ RLE/EOR/SWC
- ♦ Infrastructure
- ♦ Deep Trek





# Traditional and Section 999 Natural Gas and Oil Technology Programs *Budget (\$ million)*

	FY05	FY06	FY07	FY08
NATURAL GAS	43.6	32.7	12.0	?
<i>OIL TECHNOLOGY</i>	<i>33.0</i>	<i>31.7</i>	<i>2.7</i>	<i>?</i>
<i>SECTION 999-ULTRA DEEP</i>	<i>0</i>	<i>0</i>	<i>50.0</i>	<i>?</i>
<b>GRAND TOTAL</b>	<b>76.6</b>	<b>64.4</b>	<b>64.7</b>	<b>?</b>



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**SPR Complexes Drawdown Delivers**  
The Department of Energy has completed the last delivery of crude oil sold through its online competitive sale of the Strategic Petroleum Reserve stockpile. The sale resulted in awards of 1.1 million barrels of crude oil to five companies who submitted favorable bids. Read more >

**01:15:06 :: Technology Advances And Qual for Deep Gas**  
A cement developed as part of DOE's Deep Trak program has been commercially applied by several companies to stop seal failures in gas wells at depths up to two miles. Read More >

**01:03:06 :: Jeffrey Jarrett to Lead Fossil Energy Office**  
Jeffrey D. Jarrett was sworn in as the 10th Assistant Secretary for fossil energy after being confirmed by the Senate on December 17, 2009. Jarrett brings more than 30 years of energy and environmental experience to the job. Read More >

**OFFICE OF FOSSIL ENERGY**  
Ensuring that we can continue rely on clean, affordable energy from our traditional fuel resources is the primary mission of DOE's Office of Fossil Energy. Fossil fuels supply 85% of the nation's energy, and we are working on such priority projects as pollution-free coal plants, more productive oil and gas fields, and the continuing readiness of federal emergency oil stockpiles.

Read more about:

- Total Energy Organization
- Business & Funding Opportunities

National Energy Technology Laboratory

NETL

THE ONLY U.S. NATIONAL LABORATORY DEVOTED TO FOSSIL ENERGY TECHNOLOGY

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**Secure and Reliable Energy**  
Domestic coal, oil, and natural gas resources can contribute importantly to our nation's economic strength, energy security, and quality of life through the 21st century.

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Research for an energy secure America  
DOE Announces Concrete Success in Deep Trak Program  
A "game-changer" development in DOE's Deep Trak program has been commercially applied by several companies during recent drilling operations to stop seal failures in wells at depths up to 2 miles.

**NEWS & FEATURES**

- Site-based Monitoring Agreement in BCC's Park Cell Development Project
- DOE Announces Commercial Success in Deep Trak Program
- DOE Encourages Additional CO<sub>2</sub> Purification Technology Applications (DOE-EP-09-044)
- DOE OK for the 100,000 Cordons-Saint-Pierre

**EVENTS CALENDAR**

- 2009 West Virginia Science Week
- 2009 DOE Proceedings Conference
- 2009 Oklahoma Science Week

**PUBLICATIONS & PROJECTS**

- Accurate Environmental Baseline (TAP-2 EWB)
- Oil & Natural Gas Supply
- Coal & Power Systems
- Carbon Sequestration
- Workshop & Clear Desk

*Office of Fossil Energy's website:*

[www.fe.doe.gov](http://www.fe.doe.gov)

*NETL's website:*

[www.netl.doe.gov](http://www.netl.doe.gov)



*Strategic Center for Natural Gas and Oil*

## **Appendix 6**

### **RPSEA Unconventional Resources Plan Introduction**

**Presenter: Mike Ming**



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

**C. Michael Ming**  
**Section 999**  
**Federal Advisory**  
**Committees**  
**Arlington, VA**  
**June 21-22, 2007**

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**SECURE ENERGY FOR AMERICA**

# The Energy Policy Act of 2005 And Section 999:

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**Research, development, demonstration, and commercial application of technologies for:**

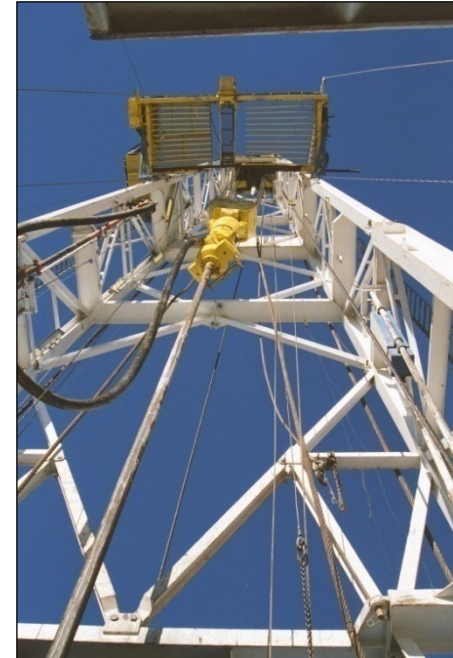
- **Ultra-deepwater – technology and architecture focus**
- **Unconventional natural gas and other petroleum resource exploration and production – resource focus**
- **The technology challenges for small producers by consortia**

**All while improving safety and minimizing the environmental impacts of activities within each area, including reduction of greenhouse gas emissions and sequestration of carbon**

# What is Section 999?

## Specifically, the law directs --

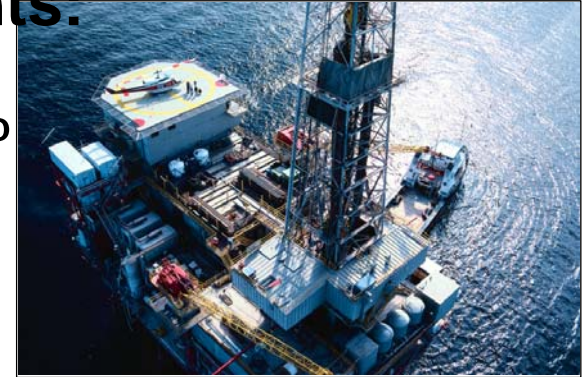
- Research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resource
- Maximize the U.S resource value by:
  - Increasing supply
  - Reducing the cost
  - Increasing E&P efficiency
  - Improving safety and minimizing environmental impacts



# What is the Program's Focus?

## The Program has four program elements:

- Ultra-deepwater 35%  
(> 1500 Meters water or  
15,000' OCS drilled depth)



- Unconventional Onshore 32.5%  
(Economic accessibility)

- Small Producers 7.5%  
(< 1000 BOEPD)

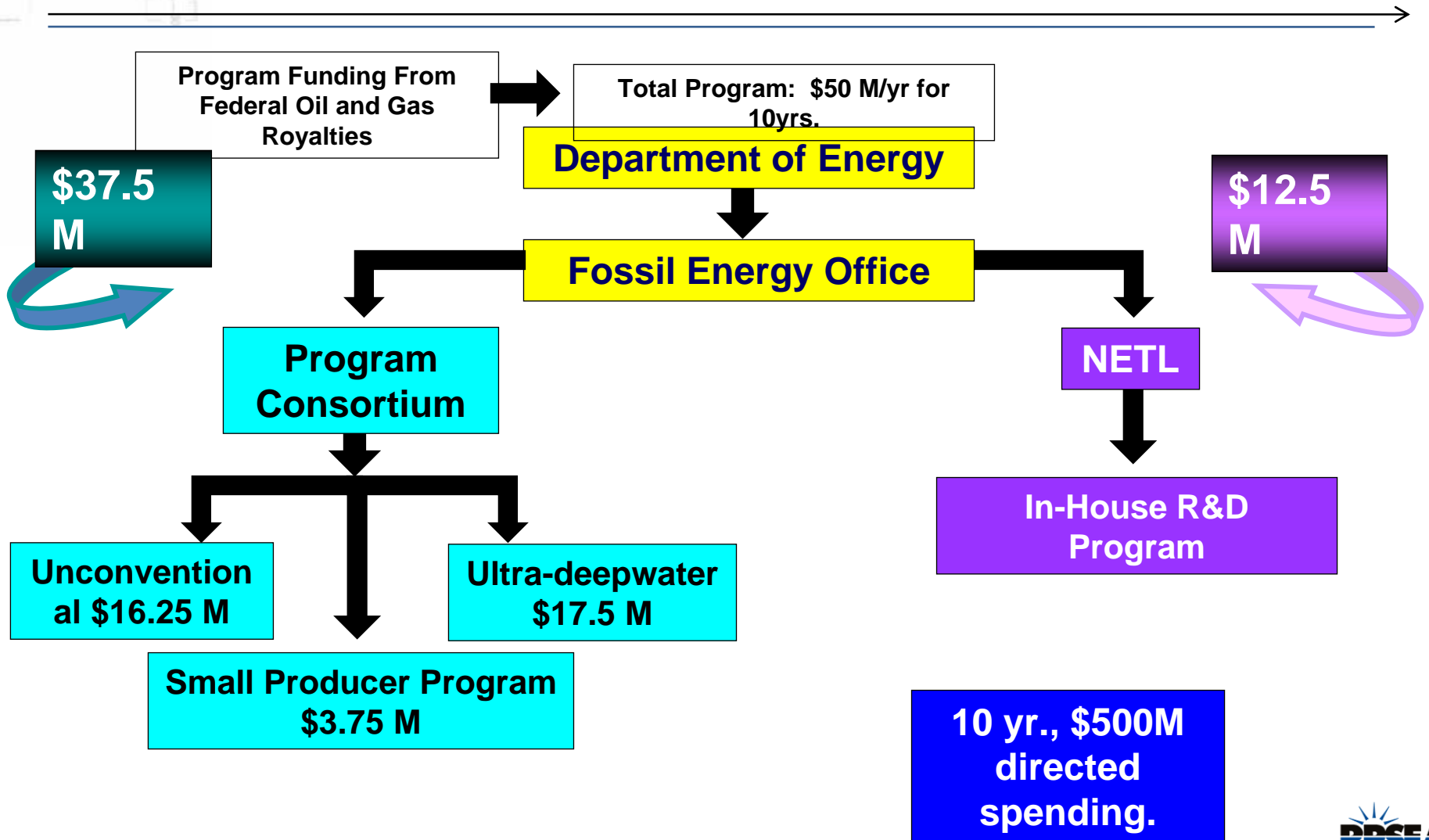
- Complementary Program 25%

Managed by NETL





# Current Program Structure/Funding

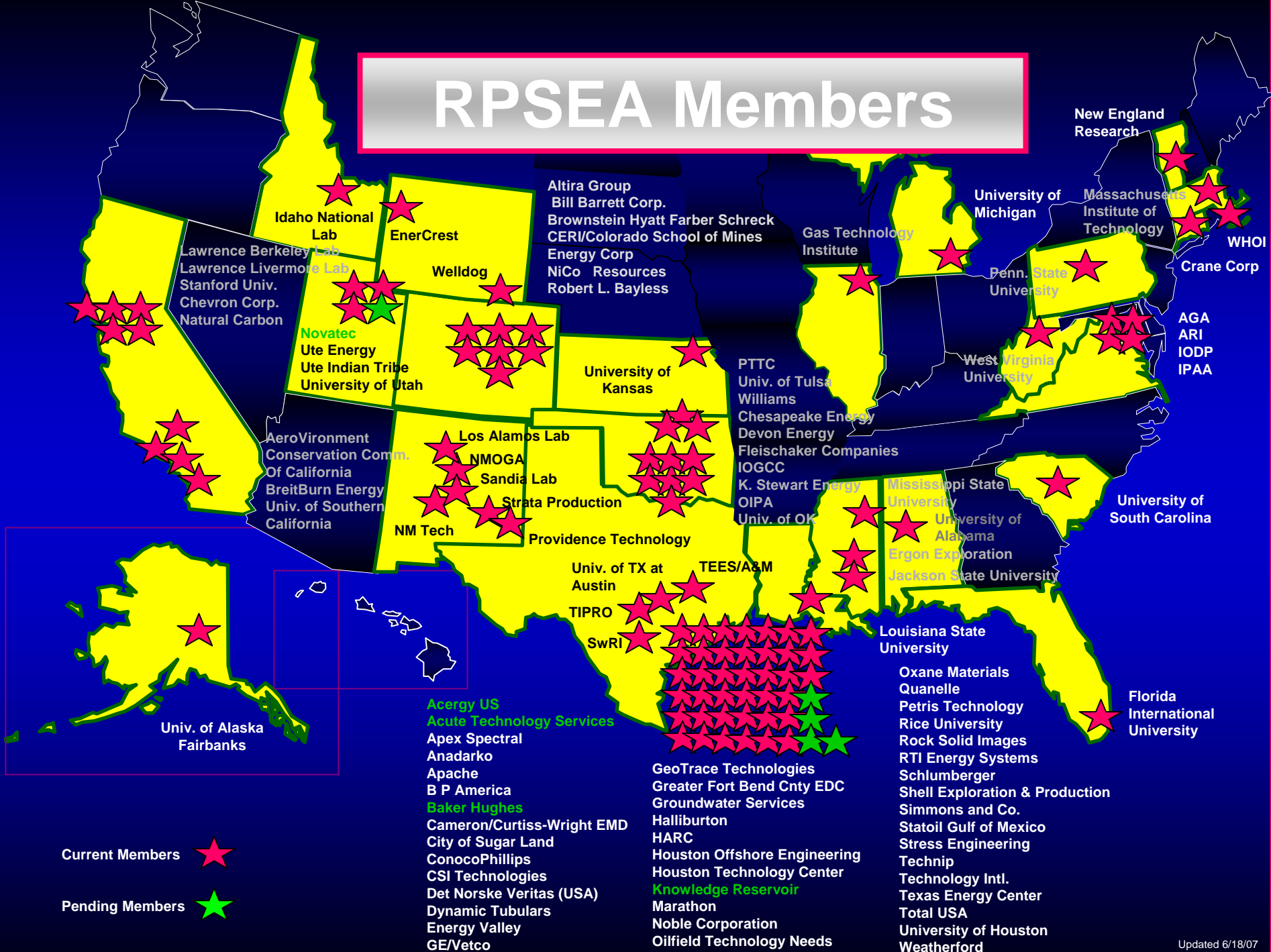


# The RPSEA Organization

- A 501(c)3 not for profit
- Competitively selected by DOE as the Section 999 Consortium Manager
- 108 Members and growing

For more information visit [www.rpsea.org](http://www.rpsea.org)

# RPSEA Members



Current Members 

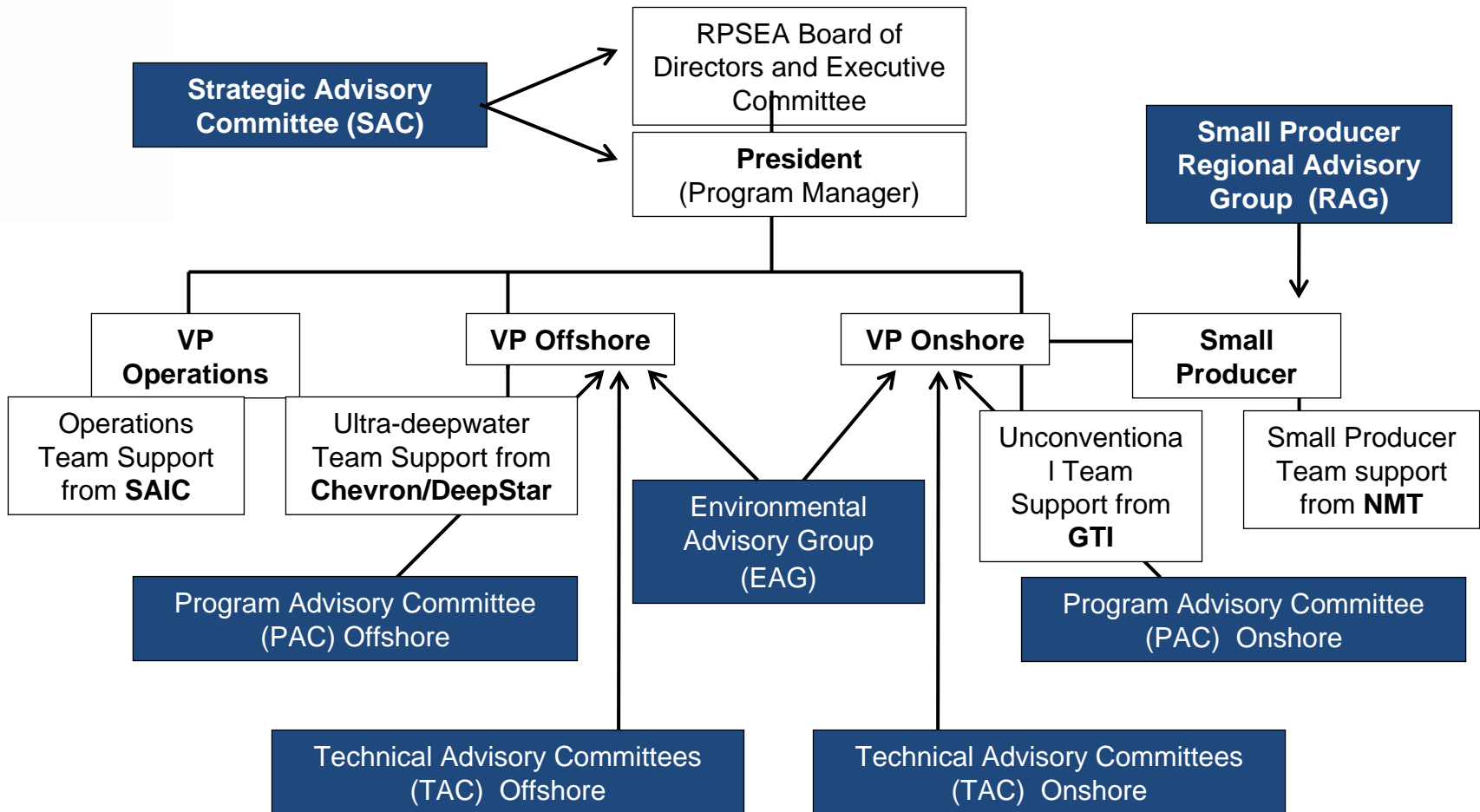
Pending Members 

- Aceryg US
- Acute Technology Services
- Apex Spectral
- Anadarko
- Apache
- B P America
- Baker Hughes
- Cameron/Curtiss-Wright EMD
- City of Sugar Land
- ConocoPhillips
- CSI Technologies
- Det Norske Veritas (USA)
- Dynamic Tubulars
- Energy Valley
- GE/Vetco

- GeoTrace Technologies
- Greater Fort Bend Cnty EDC
- Groundwater Services
- Halliburton
- HARC
- Houston Offshore Engineering
- Houston Technology Center
- Knowledge Reservoir
- Marathon
- Noble Corporation
- Oilfield Technology Needs

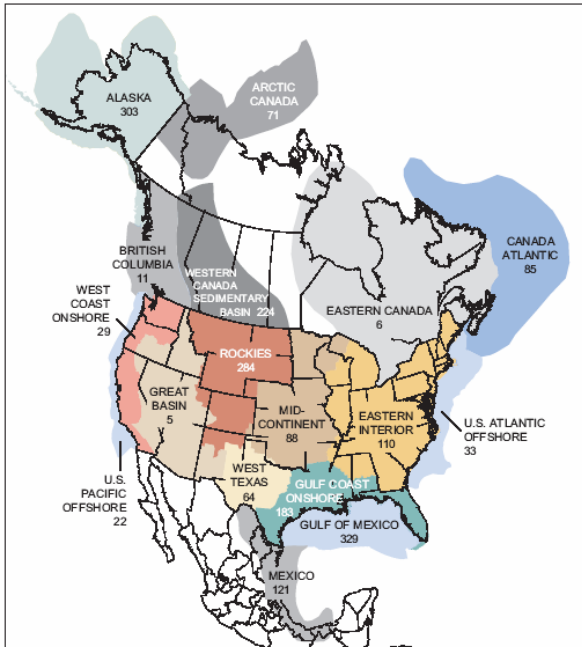
- Oxane Materials
- Quanelle
- Petris Technology
- Rice University
- Rock Solid Images
- RTI Energy Systems
- Schlumberger
- Shell Exploration & Production
- Simmons and Co.
- Statoil Gulf of Mexico
- Stress Engineering
- Technip
- Technology Intl.
- Texas Energy Center
- Total USA
- University of Houston
- Weatherford

# A Small Organization, A Large Network



Well over 1,000 experts have participated in this process!

# The Resources



NPC 2003 Technical Resources (TCF)

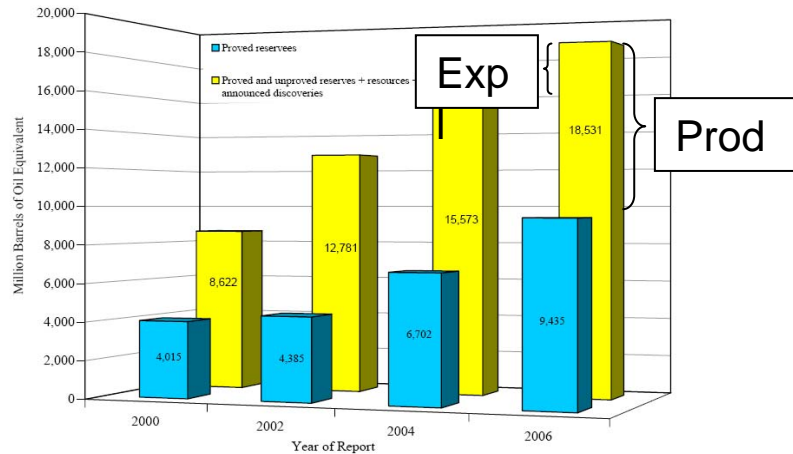
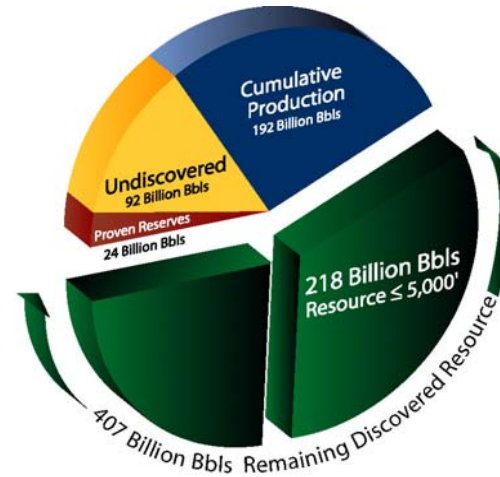


Figure 78. Comparison of 2000, 2002, 2004, and 2006 deepwater GOM reports: successive increases in deepwater BOE.

# The RPSEA Process and Input Member Forums

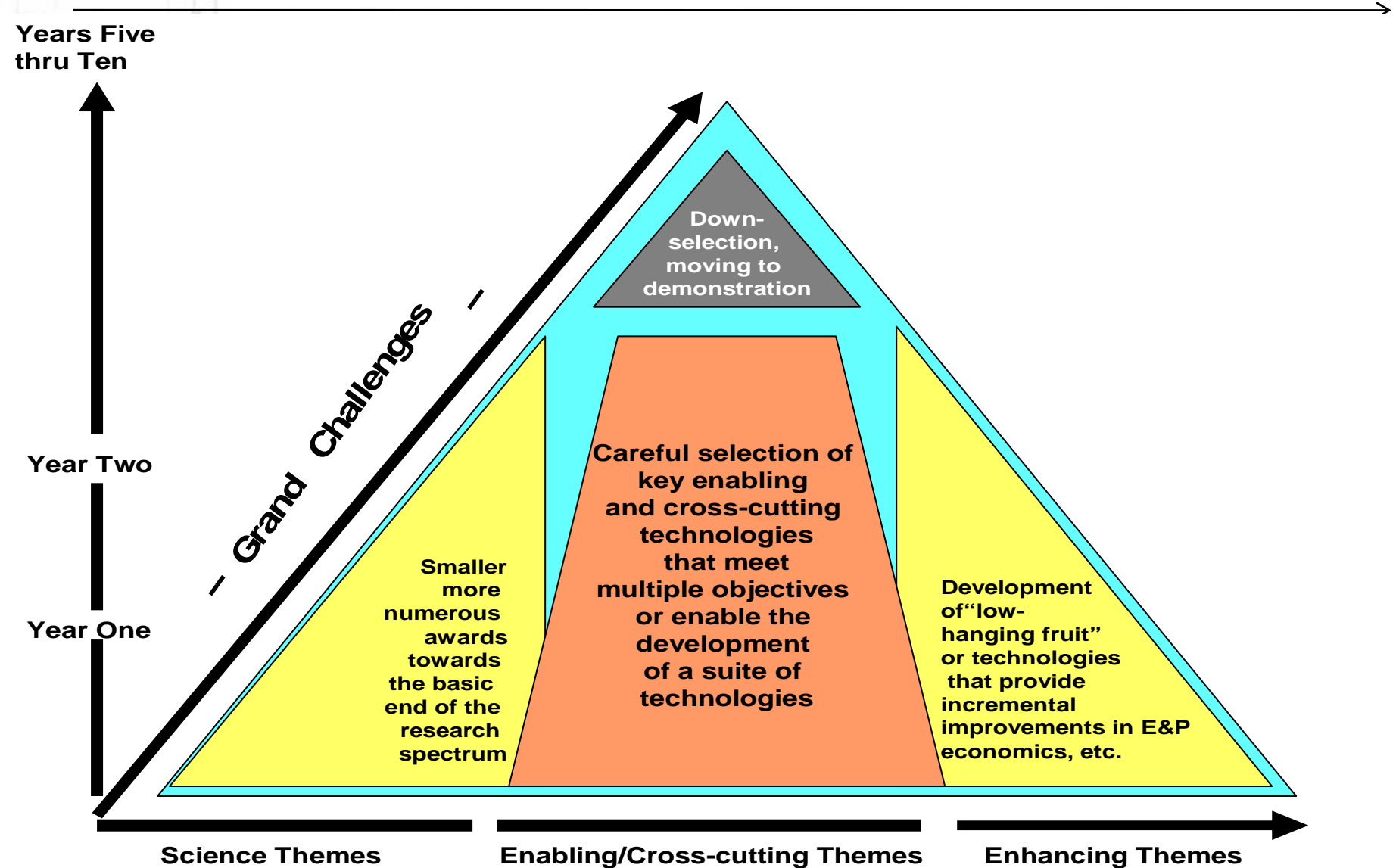
- *Louisiana State University, Groundwater Protection*
  - *Wellbore Integrity & Environmental Topics Forum (pending August 23, 2007)*
- *University of Houston*
  - *Seismic E&P Forum, October 10, 2006*
- *Massachusetts Institute of Technology & Schlumberger*
  - *Autonomous Intervention for Deepwater O&G Operations Forum, October 31, 2006*
- *Colorado School of Mines*
  - *Tight Gas, Shale Gas & Coalbed Methane Forum, November 14, 2006*
- *University of Southern California*
  - *Problem Identification Forum, November 29, 2006*
- *University of Oklahoma*
  - *Shale Gas Forum, December 5, 2006*
- *New Mexico Institute of Mining and Technology*
  - *Produced Water Forum, December 14, 2006*
- *New Mexico Institute of Mining and Technology*
  - *Small Producer Forum, December 15, 2006*
- *Massachusetts Institute of Technology & Chevron*
  - *Vortex Induced Vibrations Forum, January 12, 2007*
- *University of Tulsa & Halliburton*
  - *Flow Assurance Forum, February 8, 2007*
- *West Virginia University & NRCCE*
  - *Unconventional Plays & Research Needs for Appalachian Basin Small Producers Forum, February 15, 2007*
- *Texas A&M University & GE*
  - *Seafloor Engineering Forum, March 9, 2007*

# The 2007 Draft Annual Plan

- The Draft Annual Plan requires a 2/3 super majority vote of the RPSEA Board of Directors
- This overall process provided multiple input opportunities from well over 1,000 experts
  - Multiple Advisory Committees
  - Member forums
  - Broad member input through meetings
  - DOE et al road mapping workshops
  - NETL consultation throughout



# Some General Attributes of the Annual Plan



# The RPSEA Process and Draft Annual Plan Basics :

---

- Today present resources, processes, inputs, and themes by program element
- Focus – 8 major theme areas
  - 4 Ultra-Deepwater field types
  - 3 Unconventional Onshore resource types
  - 1 Small Producer challenge
- Component themes under each major theme are identified
- There are many players in the process!

# Some General Attributes of the Annual Plan

- Research should create leverage on
  - Funding, personnel, equipment, operations, and other resources
- Integration is a key to create synergies
  - Make 1+1=3
- Research should be accumulative to mitigate risk and build upon itself
  - Build in multiple time scales for the research plan
  - Allow for failure
  - Leave more legacies than one time projects, and plan for follow on funding
- Focus on short to mid term applied projects
  - Integrate with the NETL complementary program for more basic longer term projects
- Identify opportunities industry can't tackle or are impractical for industry to tackle

- Avoid many small projects which minimizes the potential for high impact

## **Appendix 7**

### **RPSEA Unconventional Resources Plan**

**Presenter: Bob Siegfried**



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

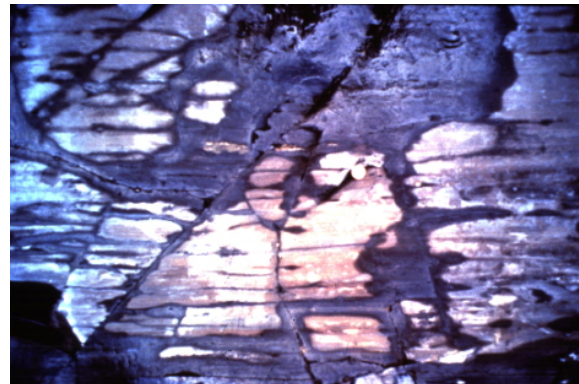
**Robert W. Siegfried, II**  
**Unconventional Resources**  
**Technology Advisory Committee**  
**Arlington, VA**  
**June 22, 2007**

---

**Secure Energy for America**

# Annual Plan Outline

- Unconventional Natural Gas and Other Petroleum Resources Exploration and Production Technology
  - Mandate
  - Resource Targets
  - Research Program
- Technology Challenges of Small Producers
  - Mandate
  - Relationship to Small Producer Community
  - Research Program





# Unconventional Resources

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## **Awards from allocations under section 999H(d)(2) shall focus on areas including**

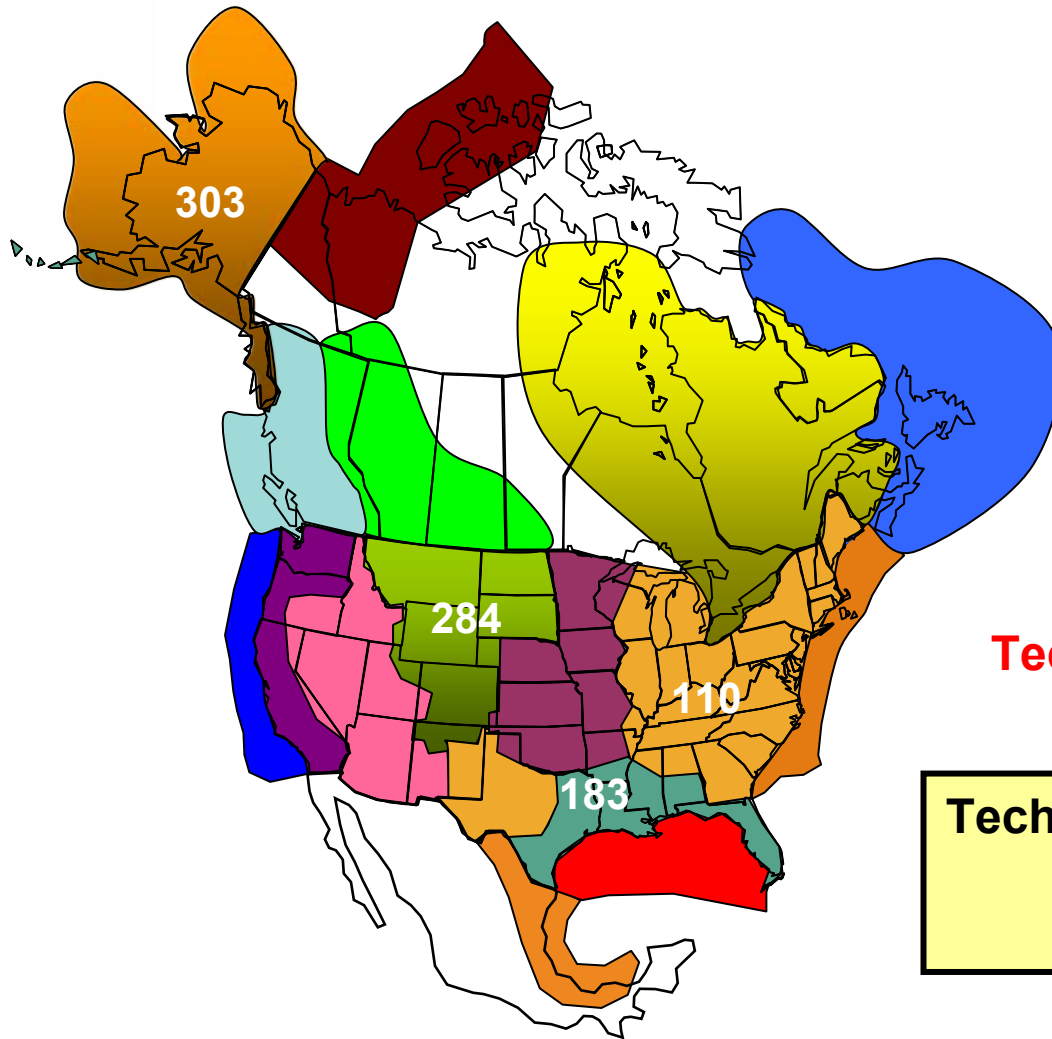
- advanced coalbed methane,
- deep drilling,
- natural gas production from tight sands,
- natural gas production from gas shales,
- stranded gas,
- innovative exploration and production techniques,
- enhanced recovery techniques, and
- environmental mitigation of unconventional natural gas and other petroleum resources exploration and production.

**Unconventional ≡ Onshore, Economically Inaccessible**

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# North American Resource Base - Large and Diverse



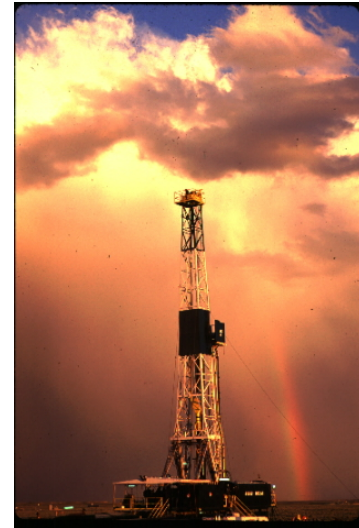
- But . . .**
- Deeper on Land
  - Tighter Rocks
  - Unconventional
  - Deeper in Water
  - Less Accessible
  - Heavily Explored

**Technically Challenging!**

**Technically Recoverable  
Resource Base  
1,969 Tcf**

# Unconventional Resources – Program Focus

- Energy production per research dollar, minimizing environmental impact
- Shales, Tight Sands, CBM
  - Easy to find, difficult to produce
  - Current industry interest
  - Potential for near-term impact
- Other unconventional resources
  - Longer-term opportunities
  - Crosscutting with ultra-deepwater, e.g. onshore deep gas



# Draft Annual Plan Inputs

R&D Planning Event	Date	Description
RPSEA/New Mexico Tech Unconventional Gas Technology Workshops	Summer 2002	Five Workshops Conducted with Independents in Five Regions (San Juan, Permian, Mid Continent, Appalachia, Rockies)
National Petroleum Council 2003 Natural Gas Study	Study Conducted During 2002 - 2003	Comprehensive Evaluation of U.S. Natural Gas Resource Base Including Unconventional Gas
DOE Sponsored Unconventional Gas Workshops	Summer 2005	Three Workshops Conducted with Independents (Houston, Denver, Pittsburgh)
RPSEA Member Forums	Conducted 2006 - 2007	Multiple Producer Meetings for Input for R&D programs and Program Structure
RPSEA Program Advisor Committee Meetings	Inaugural Planning Meeting February, 2007	Planning Session where Unconventional Resources and Technology Needs were Identified
Preliminary Input to National Petroleum Council Global Oil and Gas Study	Study to be Completed Early 2007	RPSEA participation on Technology and Unconventional Gas Teams

# Unconventional Onshore Themes

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

**Cost Reduction in  
All Aspects of  
Operations**

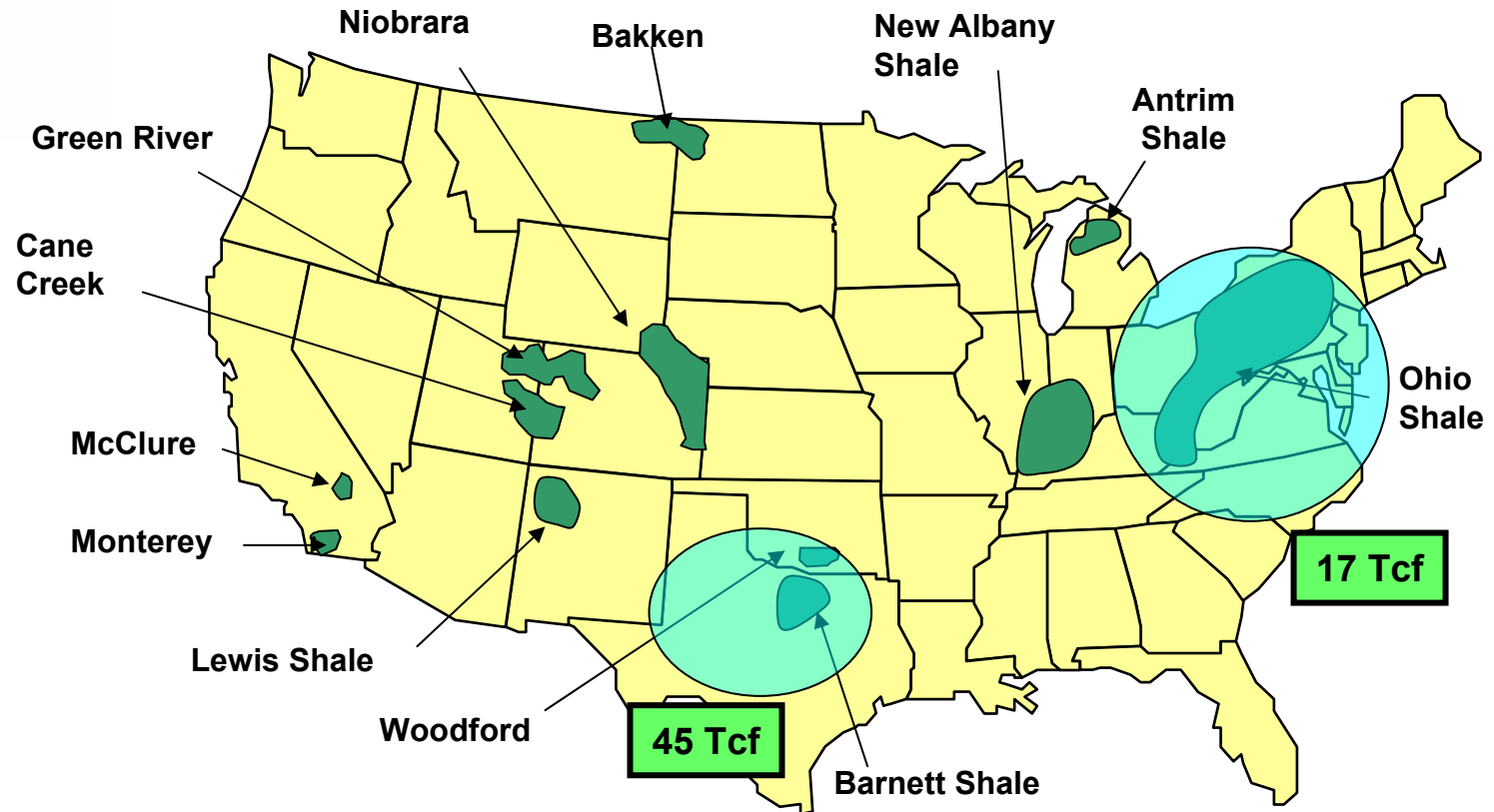
**Drill only the  
good wells!**

# Unconventional Gas Planning Matrix by Geologic Area

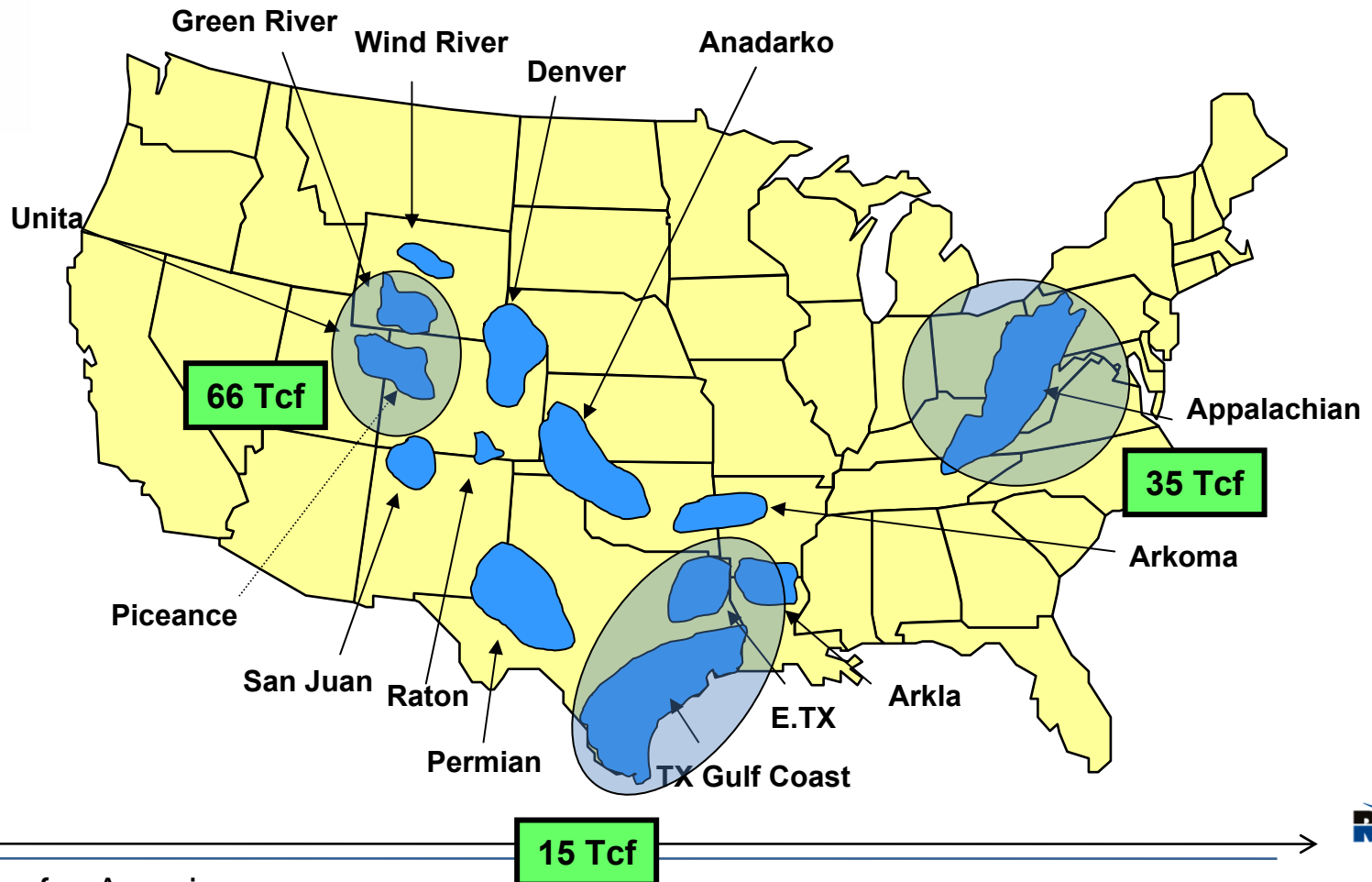
	CBM	Gas Shales	Tight Sands
<b>Existing Play</b>			
<b>45%</b>	San Juan 11	Barnett 12	Green River 11
	Appalachian 8	Appalachian 11	S. Texas 9
			Uinta-Piceance 8
	0	6	7
<b>Emerging Gas Play</b>			
<b>45%</b>	Uinta-Piceance 9	Permian 9	Uinta-Piceance/Deep 8
		Woodford-Oklahoma 5	
		Trenton-Black River 3	
	0	12	1
<b>Frontier Area</b>			
<b>10%</b>	Illinois Basin 4	Permian-Woodford 12	Western Oregon/Washington 7
	N. Mid-Continent 3	Green River 5	
	0	12	2



# Shale Gas – 69 Tcf Technically Recoverable



# Tight Gas Sands – 159 Tcf Technically Recoverable





# “The Technology Challenges of Small Producers”

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**Awards from allocations under section 999H(d)(3) shall be made to consortia consisting of small producers or organized **primarily for the benefit of small producers**, and shall focus on areas including**

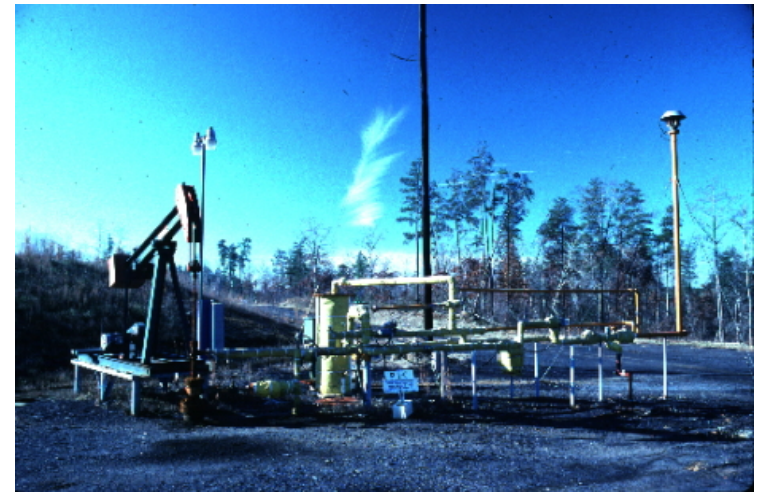
- complex geology involving rapid changes in the type and quality of the oil and gas reservoirs across the reservoir;
- low reservoir pressure;
- unconventional natural gas reservoirs in coalbeds,
- deep reservoirs, tight sands, or shales; and
- unconventional oil reservoirs in tar sands and oil shales.

**Small Producer  $\equiv$  U.S. Company,  $\leq$  1000 BOE per day**

# The Technology Challenges of Small Producers

## ***Focus Area – Advancing Technology for Mature Fields***

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



# Advancing Technology for Mature Fields

- Water Management
  - Produced water shutoff/minimization
  - Produced water treatment and disposal
  - Chemical treatment
- Improved oil and gas recovery
  - Enhanced Recovery Techniques
  - Reservoir life extension
- Reduce operating costs
  - Production operations
- Reduce Environmental Impact
  - P&A
  - Remediation



# Advancing Technology for Mature Fields

- Field tests of new technology
  - Well-documented
  - Emerging technology
- Data access and management
  - Access to existing data
  - Mining data associated with old fields
    - Create database that attracts new development investment
  - New approaches to using existing data
- Best Practices



# Advancing Technology for Mature Fields

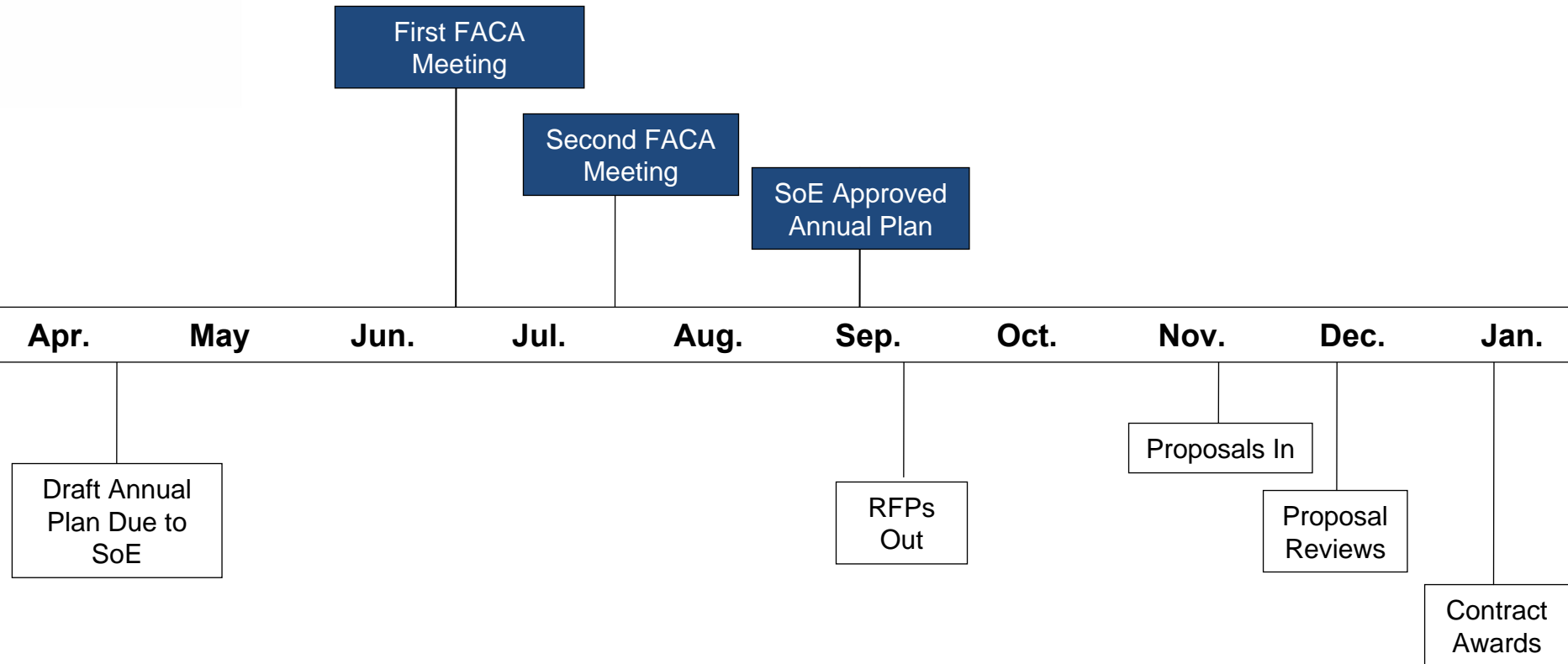
- Proposals will be required to tie into a specific application of the proposed technology development
  - Encourage active small producer involvement
  - Facilitate demonstration and commercialization





# When Do Things Happen?

## RPSEA – Estimated Program Timeline



# Questions?





## **Appendix 8**

### **Overview of EPA Act 2005 Section 999**

**Presenter: Bill Hochheiser**



# **Overview of Section 999D(b)**

**Unconventional Resources  
Technology Advisory Committee**

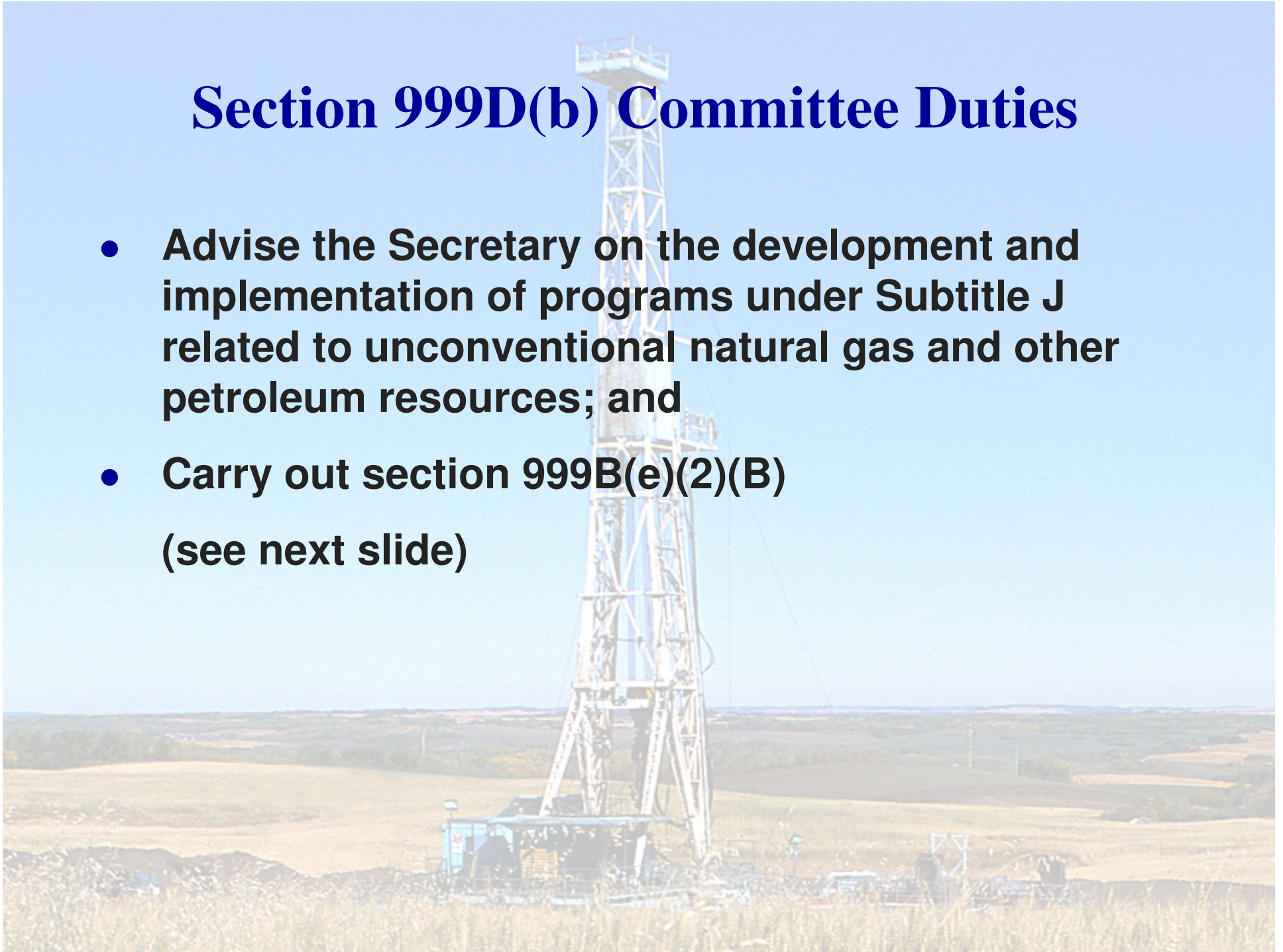
## **Section 999D(b) Membership Categories**

- **A majority of members who are employees or representatives of independent producers;**
- **Individuals with extensive research experience or operational knowledge of unconventional resource exploration and production;**
- **Individuals broadly representative of affected interests in unconventional oil and gas, including environment and safety**
- **Individuals with expertise in various geographic areas of potential unconventional oil and gas supply in the U.S.**



## **Section 999D(b) Committee Duties**

- **Advise the Secretary on the development and implementation of programs under Subtitle J related to unconventional natural gas and other petroleum resources; and**
- **Carry out section 999B(e)(2)(B)**  
**(see next slide)**



# Annual Plan Process

The background of the slide is a photograph of an oil drilling rig in a rural, hilly landscape. The rig is a tall, white metal structure with a platform at the top. The ground is covered in dry, yellowish grass, and the hills in the distance are also covered in similar vegetation. The sky is a clear, light blue.

- **Section 999B(e)(2)(B):** The Secretary shall submit the recommendations of the program consortium (the draft annual plan) to the advisory committees and such advisory committees shall provide the Secretary written comments by a date determined by the Secretary.
- **Section 999B(e)(3):** The Secretary shall transmit to Congress and publish in the Federal Register the annual plan, along with any written comments received.