
**Unconventional Resources Technology
Advisory Committee**

Comments and Recommendations

**2007 Unconventional Gas Research and
Development Annual Plan**

July, 2007

Unconventional Resources Technology Advisory Committee

Advisory Committee to The Secretary of Energy

July 25, 2007

The Honorable Samuel W. Bodman
Secretary of Energy
Washington, DC 20585

Dear Mr. Secretary:

On behalf of the Unconventional Resources Technology Advisory Committee (URTAC), it is my pleasure to submit our findings and recommendations based on our review of the unconventional resources technology and small producers portion of the Draft Ultra-Deepwater & Unconventional Gas 2007-2008 Research and Development Plan.

These findings and recommendations are at a strategic level and address the overall quality of the plan and provide general guidance regarding setting priorities and execution of the plan through the projected 10 year horizon.

Findings:

Successful execution of this R&D Program will materially contribute to U.S. supply of oil and gas both today and beyond the 10 year R&D horizon. It is the consensus of this Committee that the resource potential impacted by this technology program is significant and of major importance to the Nation. There is a critical need for a sustainable and consistent approach to the technology challenges facing unconventional resource development.

The Committee believes the Plan and the procedures followed in its development to be professional and inclusive, with a significant infusion of industry knowledge. The combined Management Team (DOE, RPSEA and its extended network of industry resources) is highly qualified to plan and execute this complex 10 year R&D undertaking.

The committee recognizes that RPSEA is in the final stages of completing the detailed plans for the first two years of the R&D efforts. We have confidence that their planning will implement the program consistent with our recommendations.

Recommendations:

The committee recommends:

- Technology Transfer
 - The Technology Transfer component of the program needs to be better formalized.
 - A Knowledge Management (KM) Database resource needs to be established and maintained.
 - Technology transfer funding needs to effectively leverage all aspects of the program to ensure a maximum benefit by augmenting and concentrating available funding resources.
 - Given the very limited funding resources available, the Small Producer Component of the program needs to be modified to focus on technology transfer and not on R&D.

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- Regulatory
 - Regulatory barriers should themselves be a subject for research, as well as considerations in the R&D process.
 - Organize and bring together key individuals from academia, regulatory entities, non-governmental organizations and industry, for one-day brainstorming session(s) to identify key regulatory barriers/issues.
 - Catalogue (identify, compile, and compare) regulatory barriers/issues (federal, state, or local) relating to Unconventional Gas development.
 - Identify and recommend regulatory best practices that can serve as flexible models for other governmental bodies to develop rules that allow Unconventional Gas resources to be produced effectively and efficiently.

- Water and Environmental Management (the Committee recommends the following Guiding Principles for RPSEA Decisions):
 - Minimize impacts to natural and cultural resources and sustaining biodiversity, and these considerations will be used in the criteria for project selection.
 - Minimize fresh water usage and encourage use of recycled fluids.
 - Catalogue existing technology and solutions for treating produced waters.
 - Develop new or improve on existing technologies to treat and reuse produced water in an economical and fit for purpose manner.
 - Develop fracturing and drilling fluids capable of tolerating treated produced water and recycled fracturing fluid based water.

- Production Research
 - Extend life of existing wellbores
 - Advance cementing practices & technology
 - Integrate CO₂ sequestration/enhanced recovery
 - Develop plans for future activities regarding unconventional oil
 - Emphasize solicitations for comprehensive characterization of the geological, geophysical and geochemical framework of unconventional resource plays.

- Exploration Research
 - Explore effectively in emerging and/or frontier basins with an emphasis on the characterization of shale gas reservoir systems.
 - Improve strategic planning process for exploration R&D.
 - Minimize the exploration footprint.

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- Plan Metrics and Funding
 - Metrics should be established to measure the success of the program. A committee of industry and other stakeholders should be established for this purpose.
 - The program should extend to all oil and gas producing regions of the U.S.
 - The deposit of full \$50 MM of no-year, non-appropriated funds into the Ultra-Deepwater and Unconventional Resources Fund must continue.
 - Increase future funding with attention to multiple Federal funding sources.

- Inter-Agency and Other Stakeholder Coordination
 - Coordinate with Federal and State resource entities such as the U.S. Fish & Wildlife Service, Bureau of Land Management, U.S. Forest Service, State Environmental Agencies and State Resource Agencies.

The URTAC recommends proceeding with implementation of the R&D Plan consistent with the guidelines outlined in our report.

Respectfully submitted,



Sally G. Zinke, Chair
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**Unconventional Resources Technology
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1.0 INTRODUCTION

The Unconventional Resources Technology Advisory Committee (URTAC) was formed in accordance with provisions of Section 999D(a) of the 2005 Energy Policy Act (EPACT)

The Committee consists of:

- A majority of members who are employees or representatives of independent producers of natural gas and other petroleum, including small producers;
- Individuals with extensive research experience or operational knowledge or unconventional natural gas and other petroleum resource exploration and production;
- Individuals broadly representative of the affected interests in unconventional natural gas and other petroleum resource exploration and production, including interests in environmental protection and safe operations;
- Individuals with expertise in the various geographic areas of potential supply of unconventional onshore natural gas and other petroleum in the United States.

The provisions of EPACT excluded from eligibility to participate in URTAC, Federal employees and board members, officers and employees of Research Partnership to Secure Energy for America (RPSEA).

The duties of the URTAC under EPACT Section 999 are to advise the Secretary on the development and implementation of programs related to unconventional natural gas and other petroleum resources and to review the draft annual research plan.

The Committee members were appointed by letters from the Secretary on May 11, 2007. Key milestones for the Committee included:

- Committee members received the draft annual plan on June 12, 2007.
- Committee members participated in a joint meeting with DOE and RPSEA representatives on June 22 in Washington, DC. During this meeting DOE and RPSEA representatives provided an overview of the entire DOE oil and gas research effort, including both the traditional R&D program and elements specified in EPACT Section 999. Committee members provided initial comments regarding the unconventional resources and small producers portion of the draft annual plan at this meeting.
- During the first two weeks of July, Committee members conducted several teleconference calls to develop and consolidate recommendations regarding the draft annual plan.
- The Committee met on July 25 in Houston. Final recommendations were agreed upon by the Committee at this meeting in accordance with the deadline set by the Secretary and the Designated Federal Officer.

Section 999 sets the funding for the overall program at a level of \$50-million-per-year over 10 years, provided from Federal lease royalties, rents, and bonuses paid by oil and gas companies. After allocations for program management by NETL and consortium R&D administration by RPSEA, the amounts to be distributed for R&D total \$42.56 million (\$32.06 million per year for consortium R&D and \$12.5 million per year for complementary R&D). It is anticipated that there will be \$13.89 million available for funding the Unconventional Resources program element during each fiscal year beginning with 2007.

2.0 EXECUTIVE SUMMARY AND RECOMMENDATIONS

These findings and recommendations are at a strategic level and address the overall quality of the plan and provide general guidance regarding setting priorities and execution of the plan through the projected 10 year horizon.

Findings:

Successful execution of this research and development (R&D) program will materially contribute to U.S. supply of oil and gas both today and beyond the 10 year R&D horizon. It is the consensus of this Committee that the resource potential impacted by this technology program is significant and of major importance to the Nation. There is a critical need for a sustainable and consistent approach to the technology challenges facing unconventional resource development.

The Committee believes the Plan and the procedures followed in its development to be professional and inclusive, with a significant infusion of industry knowledge. The combined Management Team (DOE, RPSEA and its extended network of industry resources) is highly qualified to plan and execute this complex 10 year R&D undertaking.

The Committee recognizes that the program consortium, Research Partnership to Secure Energy for America (RPSEA), is in the final stages of completing the detailed plans for the first two years of the R&D efforts. We have confidence that their planning will implement the program consistent with our recommendations.

Recommendations:¹

The committee recommends:

- Technology Transfer
 - The Technology Transfer component of the program needs to be better formalized.
 - A Knowledge Management (KM) Database resource needs to be established and maintained.
 - Technology transfer funding needs to effectively leverage all aspects of the program to ensure a maximum benefit by augmenting and concentrating available funding resources.
 - Given the very limited funding resources available, the Small Producer component of the program needs to be modified to focus on technology transfer and not on R&D.

- Regulatory
 - Regulatory barriers should themselves be a subject for research, as well as considerations in the R&D process.
 - Organize and bring together key individuals from academia, regulatory entities, non-governmental organizations and industry, for one-day brainstorming session(s) to identify key regulatory barriers/issues.
 - Catalogue (identify, compile, and compare) regulatory barriers/issues (Federal, state, or local) relating to unconventional gas development.
 - Identify and recommend regulatory best practices that can serve as flexible models for other governmental bodies to develop rules that allow unconventional gas resources to be produced effectively and efficiently.

¹ See Section 3 for detailed recommendations.

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- Water and Environmental Management
The Committee recommends the following guiding principles:
 - Minimize impacts to natural and cultural resources, sustain biodiversity, and use these considerations in the criteria for project selection.
 - Minimize fresh water usage and encourage use of recycled fluids.
 - Catalogue existing technology and solutions for treating produced waters.
 - Develop new or improve on existing technologies to treat and reuse produced water in an economical and “fit for purpose” manner.
 - Develop fracturing and drilling fluids capable of tolerating treated produced water and recycled fracturing fluid based water.

- Production Research
 - Extend life of existing wellbores.
 - Advance cementing practices & technology.
 - Integrate CO₂ sequestration/enhanced recovery.
 - Develop plans for future activities regarding unconventional oil.
 - Emphasize solicitations for comprehensive characterization of the geological, geophysical and geochemical framework of unconventional resource plays.

- Exploration Research
 - Explore effectively in emerging and/or frontier basins with an emphasis on the characterization of shale gas reservoir systems.
 - Improve strategic planning process for exploration R&D.
 - Minimize the exploration footprint.

- Plan Metrics and Funding
 - Metrics should be established to measure the success of the program. A committee of industry and other stakeholders should be established for this purpose.
 - The program should extend to all oil and gas producing regions of the U.S.
 - The deposit of full \$50 MM of no-year, non-appropriated funds into the *Ultra-Deepwater and Unconventional Resources Fund* must continue.
 - Increase future funding with attention to multiple Federal funding sources.

- Inter-Agency and Other Stakeholder Coordination
 - Coordinate with Federal and State resource entities such as the U.S. Fish & Wildlife Service, Bureau of Land Management, U.S. Forest Service, State Environmental Agencies and State Resource Agencies.

Detailed recommendations are provided in Section 3.

3.0 SUB GROUP REPORTS

At the June 22nd meeting the following Subgroups and schedule were established for developing the Subgroup analyses and reports.

Six Recommendation Areas:

- Technology Transfer
- Regulations
- Water and Environmental Management
- Production Research Themes
- Exploration Research Themes
- Metrics and Funding

Schedule

- 7/6 – Recommendations to leaders
- 7/11 – Compilation of list sent to sub-team
- 7/13 – Sub-team conference call
- 7/17 – Consolidation list sent to all
- 7/25 – Meeting in Houston

Treatment of Non-Consensus

In situations where members were divided, the following categorization was used:

Majority Agreement – 50% or greater of Committee members were in agreement with the statement

Minority Opinion – fewer than 50% of Committee members were in agreement with the statement

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3.1 TECHNOLOGY TRANSFER

Technology Transfer (TT) is one of the most important aspects of R&D and it needs to be carried out in a manner such that the results are disseminated to the widest possible audience. The Annual Plan provides insufficient specifics or even guidelines on how TT would be accomplished. It cannot be left for later development.

The Committee recommends the following:

1) The Technology Transfer (TT) Component of the Program Needs to be Better Formalized:

The Committee believes that the following should be included in the Technology Transfer aspects of the program:

- Program should consist of both technical forums with published proceedings and web based Knowledge Management database.
- Technical forums should provide information of interest to the widest audience of producers possible for maximum dissemination (national coverage).
- All TT should be part of an on-going program, as isolated TT efforts for individual R&D projects have proven to not be as effective as those done as part of an on-going coordinated effort.
- The TT component of the program should be to satisfy the “metric of measurement of success” of extending the program to all petroleum producing regions of the United States.

2) Knowledge Management (KM) Database Resource:

The preservation of data from the R&D projects and Technology Transfer program must be retained in a database for maximum dissemination (both near and long term) to the end users. Elements of a successful database resource should include:

- DOE should identify funding for the creation of a database or customization of an existing database as a repository for the information created.
- Project requirements should specify that a portion of the 2.5% TT funding component be used to create information to be input into a web-based Knowledge Management database.
- The RPSEA should be required to ensure that R&D results be put into a Knowledge Management database to serve as a resource of technology for producers.
- KM should have the following aspects: be web-based; user sign-in and password (requires registration but open to public); standard template format for input; subject matter review process; a knowledge push and/or community notification system to stimulate and maintain interest; and expected criteria for success.
- Existing petroleum technology transfer databases such as the one already developed by the Petroleum Technology Transfer Council (PTTC) should be used to the maximum extent possible to reduce development and maintenance costs.

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3) Technology Transfer Funding To Accomplish What Needs to be Done:

Technology Transfer funding is inadequate to accomplish what needs to be done. Given the very limited funding available, the DOE needs to efficiently leverage all aspects of the program to ensure a maximum return:

- Augment funding from other sources such as the Ultra-Deepwater Program, NETL, other DOE funding, membership programs, and attendance receipts.
- Concentrate funding to serve specific purposes such as requiring grant awardees to invest their TT funding (2.5% of grant amount) in specifically structured ways, such as: (a) development of TT workshop materials; (b) development of material for web-based Knowledge Management database; (c) participation in specified workshops.
- Leverage funding by use of existing programs for the TT component of the DOE program whenever possible, such as PTTC. Fewer dollars would have to be spent than that required to maintain separate program. There would also be a wider dissemination of information.

4) Use of Funds for the Small Producer Program for Technology Transfer:

The most beneficial use of funds for the Small Producer Program is for technology transfer. The Small Producer component of the Program provides the opportunity to extend the program to a much larger audience whose needs are vastly different than those of larger producers. However, with the limited resources available, significant changes need to be made to the proposed program:

- The funding for the Small Producer Component should concentrate on producer education, and be focused on on-going regional problem identification and technology transfer to solve existing problems with following requirements:
 1. Development of structured materials/proceedings for workshops.
 2. Input of material into web-based Knowledge Management database.
- It is best to use existing programs such as PTTC which already have the industry acceptance and structure to carry out such a program. The Annual Plan, as written, makes no mention of utilizing these valuable resources.
- Given the limited resources available, R&D shouldn't be a focus of this component of the program. R&D projects shouldn't be developed with just "small producers" in mind; R&D benefits all producers.

Additional Comment: Timely release of research results by Federal agencies (including DOE, EIA, and USGS) to the oil and gas exploration and development community, can advance understanding of unconventional resources. We recommend an examination of whether agency regulations or policies may so impede such releases as to merit a "best practices" research solicitation.

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3.2 REGULATION

The Committee agrees with the Annual Plan (p. 140): *Regulatory barriers must be identified and understood early in the program development process as they have direct impact on technology solutions*, but regulatory barriers themselves should also be a subject for research.

Unconventional resource development (including gas shales, CBM, tight sands) is sometimes unnecessarily impeded / negatively impacted by governmental regulatory barriers (Federal, state, local) such as rules for well spacing/density, and field development patterns originally developed for conventional reservoir development. For example: state regulatory rules applied to traditional vertical wells may be wholly inappropriate for horizontal wells into unconventional reservoirs.

The Committee recommends the following:

1. Organize and bring together key individuals from academia, regulatory entities, non-governmental organizations and industry, for one-day brainstorming session(s) to identify key regulatory barriers/issues relating to unconventional gas (gas shales, CBM, tight sands) development and propose suggested solutions and/or research opportunities; and based on such sessions,
2. Solicit research from appropriate entities (such as IOGCC ²) to:
 - a. Catalogue (identify, compile, and compare) regulatory barriers/issues (Federal, state, or local) relating to unconventional gas development; and
 - b. Identify and recommend regulatory best practices that can serve as flexible models for other governmental bodies to develop rules that allow unconventional gas resources to be produced effectively and efficiently, while protecting correlative rights, preventing waste and the drilling of unnecessary wells, and protecting natural resources and the environment.
 - c. Suggest additional research to address key regulatory barriers, including barriers/issues relating to development of unconventional petroleum resources in future plan years.

² Interstate Oil and Gas Compact Commission

3.3 WATER AND ENVIRONMENTAL MANAGEMENT

Recognizing that unconventional gas development is critical to the nation and that such operations are primarily the province of independent producers and that they require fresh water, generally in water-scarce areas, the Committee endorses the Water Management portion of the Annual Plan, with the following recommendations and prioritization in the area of fresh water conservation and sustainable development:

Guiding Principles:

- The improvements to development opportunities comprising the thrust of the Plan should be with an explicit view to minimizing impacts to natural and cultural resources and sustaining biodiversity, and these considerations will be used in the criteria for project selection.
- Minimize fresh water usage and encourage use of recycled fluids

Tight Gas and Shale Gas

The Committee strongly endorses the RPSEA proposal to make water management a focus of the intended development. This is in recognition of the facts that these areas are going to be the major source of natural gas in the US within five years, and that independents operate heavily in this arena and that the reservoirs tend to be in water scarce areas. While the plan is well conceived, we recommend the following:

- Catalogue (identify, compile, and compare) existing technology and solutions for treating produced waters.
- Develop new or improve on existing technologies to treat and reuse produced water in an economical and *fit for purpose* manner. The purposes, not in order, include: petroleum operations (e.g., fracturing and drilling fluids and cementing), agriculture, industrial processes, or other potentially beneficial uses.
- Develop fracturing and drilling fluids (in that order) capable of tolerating treated produced water and recycled fracturing fluid based water.

Coal Bed Methane

The Committee strongly endorses the specific objectives in this area, in particular recognition of the fact that, unlike other petroleum resources, the associated water is produced before the gas, and so reservoir development requires a viable water management plan. We offer the following guiding statement:

- Develop new or improve on existing technologies to treat and reuse produced water in an economical and *fit for purpose* manner. The purposes, not in order, and recognizing the relative purity of this water, include: petroleum operations (e.g., fracturing and drilling fluids and cementing), agriculture, industrial processes, or other potentially beneficial uses.

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3.4 PRODUCTION RESEARCH

The Committee recommends the following:

- Extending life of existing wellbores
 - Through fluid loss additives, behind pipe pay identification etc.
- Advance cementing practices and technology
 - Reduce microannulus development
- CO2 Sequestration/Enhanced Recovery
 - The program incorporate one or more elements regarding the sequestration of carbon dioxide along with enhanced recovery efforts
 - Program managers should consult with national laboratories and other industry experts to determine how best to integrate R&D activities regarding sequestration with the larger DOE program.
- Future plans should include both oil and gas, taking into account current reserves, potential increase in recovery, activity, and production.
 - Amend the first year plan to have the Consortium perform a preliminary examination of “other petroleum” opportunities, using Consortium program administration funds.
 - Thoughtfully identify “other petroleum” R&D opportunities and consider the demarcations between Consortium and Complementary programs in future years (2-10) of the EPACT 999 program in light of available funding.³
- The Committee recommends the following be emphasized as a focus area in the solicitation for proposals under shale gas and tight sands
 - Comprehensive characterization of the geological, geochemical, and geophysical framework of unconventional resource plays, particularly emerging plays

Supporting Comments:

RPSEA’s earlier, thoughtful process for identifying the three *natural gas* theme areas that comprise the plan’s Unconventional Resources program element relied heavily on a 2003 National Petroleum Council (NPC) study that considered only natural gas.⁴

The NPC’s new global report (approved July 18, 2007)⁵ adds information about onshore oil resources, data that RPSEA and its advisers have obviously not had time to digest.

For example, NPC 2007 reports estimates of potential payoff from promoting enhanced oil recovery (EOR) from existing reservoirs at an additional 90 to 200 billion barrels of recoverable oil in the United States alone. (EPACT would classify part as “unconventional” because they are uneconomic resources,

³ NETL’s complementary program element in the draft lists “enhanced and unconventional oil recovery” as a focus.

⁴ NATURAL GAS POLICY – FUELING THE DEMANDS OF A GROWING ECONOMY. (NPC 2003).

⁵ FACING THE HARD TRUTHS ABOUT ENERGY. (NPC 2007) 422 pages.

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even though NPC's concept might classify them as "conventional".⁶⁾ These new estimates did not exist in 2003 when NPC produced its natural gas policy study.

Section 999 of the Energy Policy Act (EPACT) of 2005 speaks of two Unconventional onshore resource categories: natural gas resources *and* "other petroleum" resources. The Executive Summary in the draft of a first Annual Plan may seem to exclude "other petroleum" resources as a topic to be addressed by the RPSEA Consortium, reserving it to be addressed to some extent by the NETL complementary Program. However, although the draft plan contemplates no R&D *awards* by the Consortium for "other petroleum" during the first year, the President of the RPSEA Consortium laudably advises that they will undertake *program administration* examination of "other petroleum" opportunities.

⁶ For example, NPC 2007 classifies all CO₂-EOR R&D as "conventional" in Chapter 3: Technology (page 19 of 62) even as it describes various Existing, Emerging, and Frontier CO₂-EOR technologies (pages 20-22 of 62).

3.5 EXPLORATION RESEARCH

- 1) **Exploration in Emerging and/or Frontier Basins with an Emphasis on the Characterization of Shale Gas Reservoir Systems.** Exploration Technology R&D for unconventional gas resources must include initiatives to use promising new technologies that will increase the comprehension and cataloging of the geological framework and petroleum systems within emerging and frontier basins. Expanded data collection, improved database and software functionality should be undertaken to facilitate the evaluation of the shale gas resource potential (and other resources such as coal bed methane and tight sandstones) and help predict the characteristics of reservoirs, traps, and seals. We recommend the research considered include first and secondary principles of unconventional systems. These may include (but not restricted by) original characteristics such as depositional settings, mineralogy, organic matter type and secondary imprints of the basin setting and tectonic regime overprinted on the system. We prefer those research topics that have transferrable learnings for a broad geographic area.
- 2) **Improve Strategic Planning Process for Exploration R&D.** The Committee encourages additional investigative efforts, including workshops and surveys with an emphasis on shale gas to complement the existing strategic plan. More specifically, this process should focus on Exploration technologies deemed critical by representatives from industry.
- 3) **Minimize the Exploration Footprint.** The Committee recommends soliciting proposals in the area of exploration technology research that will reduce surface disturbance and infrastructure development, prioritize and reduce the number of drilling locations and promote greater drainage efficiency and strive to reduce water impacts for unconventional resources. Take the lessons learned from developed fields and apply them to the exploration phase of new plays. The results of greater understanding and better characterization of developing plays will be a more orderly development process and ultimately a minimal footprint.

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3.6 PLAN METRICS AND FUNDING

Metrics

The Committee recommends development of metrics by which to measure the success of the program that go beyond those that are required by statute (e.g., impact on Federal royalty revenues) to include others that may be of concern to various stakeholders. Metrics of program success must serve purposes of both internal assessment and outside review, such as:

- Increased identified resource endowment in areas where they are not well quantified and reduced uncertainty of the resource volume.
- Increased resources and reserves (both technically recoverable resources and increased economic reserves due to application of new technologies and reduced operating costs).
- USA jobs retention and/or growth.
- Increased recovery factor of oil in place due to application of new technologies.
- Increased revenues to operators and royalty owners and, consequently, increased revenues to the local, state and Federal government.
- Oil and gas production contribution to Gross Domestic Product.
- Off-setting of imports of oil and gas and, consequently, on improved Balance of Payments.
- Technology exposure consisting of number of case studies developed, technology transfer events held and number of producers exposed to technologies that will result in production of additional reserves.
- Environmental: reduced footprint and reduced emissions.

The Committee strongly recommends extending the program to all oil and gas producing regions of the United States. While individual grant projects in the first year may be situated in one region, plans should be announced early in the program to place projects in other regions. The technology transfer component should extend to various regions of the country starting with the first year.

The development of suitable metrics has proven to be difficult for past R&D and technology transfer projects because different groups and oversight agencies evaluate results differently. For this reason, it is strongly recommended that a committee of industry and other stakeholders outside of RPSEA be appointed by DOE to develop, recommend and evaluate suitable metrics to be used in conjunction with the DOE R&D programs such as this.

Funding

The Advisory Committee regards most positively Congress's dedication of \$50 million a year out of Federal royalties for 10 years, starting in this FY2007, toward Federal contributions for domestic oil and gas R&D. This money funds the onshore unconventional resources and small producer programs, the ultra-deepwater program and the NETL complementary program.

The Committee believes that the deposit of no-year non-appropriated funds into the *Ultra-Deepwater and Unconventional Resources Fund* must continue (in addition to annual Congressional appropriations for DOE's traditional or "core" oil and gas R&D programs) and must be used solely for the purposes of this research program as provided under EPACT. This certainty of funding is required in order to implement an efficient and effective long-term R&D program, which the Committee strongly believes is in the national interest.

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Furthermore, the Committee questions the adequacy of the current EPACT Section 999 level of \$50 million per year plus appropriations at recent levels, especially regarding onshore opportunities and vital national interests. The Committee, therefore, recommends:

- Attention to multiple Federal funding sources and raised funding levels in order to assure that our national government makes requisite efforts to unlock and use the oil and gas endowment right here at home, and
- That the second and subsequent annual plans indicate the potential benefits that could be realized through increased funding, for example, by reviewing meritorious opportunities recently foregone due to spending limits.

Supporting Comments:

The USA is blessed with large onshore resources of natural gas and oil that are not economically accessible today but could become accessible, on meaningful timetables, if government and industry make requisite investments in R&D and technology transfer.

Proving up USA onshore resources and bringing them into production more rapidly could yield enormous public benefits – worth hundreds of billions of dollars a year – in terms of national security, reduced imports and more favorable balance of payments, less dependence on foreign nationally-owned oil companies, high-quality science and technology jobs in the U.S. and research opportunities for faculty and students at American universities, income to workers and royalty owners (private, state and local as well as Federal royalty owners), and consequently tax revenues.

Developing reserves in the USA will be environmentally more benign than development in many other countries. Also, national oil companies are committing more of their national resources to their own development plans rather than export, the U.S. needs to develop its own resources.

Industry, in the case of onshore resources, means primarily independent oil and gas firms. Independents traditionally invest their cash flow into development of onshore reserves, and will leverage government-sponsored research and technology. The dramatic growth of coalbed methane production over the past 20 years illustrates how the independents leverage good long-term R&D.

The Committee believes that if the Federal government does not sponsor research like this, it will not happen.

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3.7 INTER-AGENCY AND OTHER STAKEHOLDER COORDINATION

Research and resource management efforts by other state and Federal natural resource agencies that address wildlife and wildlife habitat concerns are of potential value in planning energy research and demonstration projects. We recommend coordination with Federal and State resource entities such as the U.S. Fish & Wildlife Service, Bureau of Land Management, U.S. Forest Service, State Environmental Agencies and State Resource Agencies.

4.0 APPENDIX

SUPPORTING DETAIL FOR SECTION 3.4 – PRODUCTION RESEARCH

Emerging Williston Basin Bakken crude oil resources illustrate roles of independents of varying sizes and of technology transfer work of the PTTC for realizing onshore potentials in the USA (particularly since major oil companies shifted attention to prolific foreign and deep GOM resources). The current play, started by an independent in Montana (named AAPG’s “Explorer of the Year”) and sustained by independents⁷ – with PTTC forums driving technology transfer – accounts for the largest onshore discovery since Prudhoe Bay (MT’s Elm Coulee Field, discovered in 2000, now produces over 50,000 BOD; ND Bakken almost 10,000 BOD).

- Estimates of generated oil (mostly remaining in place) range up to 500 BBO, with a most probable range of 200-300 BBO according to the ND Geological Survey.⁸
- USGS impeded technology transfer by withholding data and analyses left by USGS petroleum geochemist Leigh C. Price who died in 2000.⁹

(Bakken, a light, sweet, liquid crude oil sourced from upper and lower Bakken shales, is produced from the source rock itself or, now more likely, from immediately adjacent rocks to which this oil was expelled without undergoing migration. Bakken oil is often deemed “unconventional” in the sense of being in a continuous-type formation. Challenges are to understand what makes for success in some oil wells and not others, and to raise recovery factors by several percentage points – issues paralleling those for continuous-type Barnett Shale gas.)

Changing unconventional oil appraisals by the Energy Information Administration (EIA) in DOE:

- New, long-term projections in EIA’s Annual Energy Outlook 2007 (AEO, a February publication) reflect for the first time an additional 20 BBO of onshore, lower-48 crude oil as part of the technically recoverable crude oil resource base – an increase of more than 20 percent (3.6 BBO for Bakken crude oil of the Williston Basin and 16 BBO for additional CO₂-EOR).
- That increase drives up projected onshore production, notably in the Rockies.¹⁰

⁷ *Wildcat Producer Sparks Oil Boom on Montana Plains; Size of Find Still Unclear*, Wall Street Journal, Apr. 5, 2006, page A1.

⁸ LeFever, J. and Helms, L. *Bakken Formation Reserve Estimates* [https://www.dmr.nd.gov/ndgs/bakken/newpostings/07272006_BakkenReserveEstimates.pdf]; Grape, S. *Technology-Based Oil and Natural Gas Plays: Shale Shock! Could There Be Billions in the Bakken?* [<http://tonto.eia.doe.gov/FTP/ROOT/features/ngshock.pdf>].

Also, other articles at <https://www.dmr.nd.gov/ndgs/bakken/bakken.asp>

⁹ See <http://www.undeerc.org/Price> which is linked on the PTTC Rocky Mountain web site.

¹⁰ NPC 2007 summarizes: “... The United States produced 5.2 MB/D of conventional crude oil in 2005, but its domestic production is at best rising slightly in absolute terms while declining as a share of domestic demand. Existing fields ... are generally not seen as having the potential to reverse existing declines. The EIA AEO2007 includes cases showing U.S. conventional crude oil production ranging between 5.25 MB/D and 6.04 MB/D in 2030.” [Chapter 2: Supply, Part III: Analysis of Energy Outlooks, Page 12 of 28; .pdf 163 of 422]

**Unconventional Resources Technology
Advisory Committee Report**

COMMITTEE MEMBERS

Mr. Eugene L. Ames III	Petroleum Geologist and General Manager	Nordan Trust	San Antonio, TX
Dr. Fred Aminzadeh	President-Elect	SEG	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	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 (Resigned July 11, 2007)	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

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SUBGROUP TOPICS AND MEMBERS

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

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