

Unconventional Resources Technology Advisory Committee

Advisory Committee to The Secretary of Energy

October 22, 2010

The Honorable Dr. Steven Chu
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 *2011 Annual Plan* for the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program.

The Committee finds that:

- The interest shown by the current Administration in the Department of Energy's (DOE) Section 999 Research and Development (R&D) programs is itself a major change in focus that is very welcome news to the Committee.
 - The Committee recognizes that the DOE is proposing a major shift in focus to more substantively address safety and environmental concerns. However, we believe that a balance needs to be achieved between the intent of the Section 999 legislation under which the existing program has been carried out, and the change of emphasis being proposed by the DOE.
 - The environmental concerns that have arisen because of the recent expansion of oil and gas activity into new onshore areas (such as the Marcellus) have given rise to issues that need to be addressed, researched, and resolved. We strongly agree that some of these issues are well suited to R&D award topics under the Section 999 program, but not to the exclusion of the existing program topics.
 - Additional funding that is authorized under Section 999 should be requested by DOE. This would better enable the pursuit of additional research topics specifically focused on environmental and safety, and also allow an increase in emphasis on environment and safety within existing projects, without detracting from the core elements of the existing program.
 - The Committee believes that the following areas deserve a higher priority in the research program: well isolation and integrity, water use and re-use of produced, flowback, and frac waters, and methods to reduce air quality impacts.
 - The Committee applauds the DOE's development of a modern and accessible knowledge management database. A robust Technology Transfer program is critical to the success of the Unconventional Resources and Small Producer programs.
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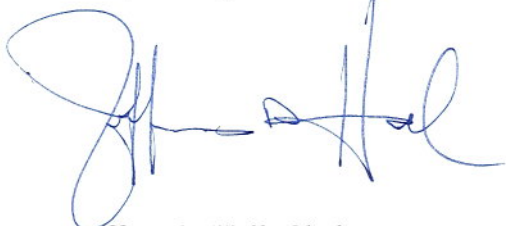
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These key findings are addressed in the report along with other observations and recommendations made by the Committee members. As experts and professionals in our areas of expertise, we believe that they are worthy of consideration and implementation.

The URTAC recommends proceeding with the continued implementation of the *2011 Annual Plan* consistent with the guidance outlined in our report.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "Jeffrey D. Hall". The signature is fluid and cursive, with a large initial "J" and "H".

Jeffrey D. Hall, Chair
(405) 552-4544

**Unconventional Resources Technology
Advisory Committee**

**Comments and Recommendations
2011 Annual Plan**

OCTOBER 2010

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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, 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 the following: 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 of Energy 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 September 2, 2010. Key milestones for the Committee included:

- Committee members received the initial Draft 2011 Annual Plan on August 18, 2010.
- Committee members met on September 9th, 2009 in Sugar Land, Texas. The agenda included a briefing of the Role of Oil and Gas in the Administration's Energy Policy by Deputy Assistant Secretary Christopher Smith who presented a revised Draft 2011 Annual Plan to the committee for consideration, status update and overview of the Oil and Gas Research Program by the NETL, and an overview of the Program's Consortium's 2011 Draft Annual Plan by RPSEA. Committee members provided comments on Deputy Assistant Secretary Smith's briefing and initial comments regarding the original plan received on August 18th, 2010. The Chair appointed sub-groups to work on sections of the plan.
- During the period from September 9th through October 13th, the appointed sub-group members conducted several meetings by teleconference and E-mail to develop and consolidate recommendations regarding the draft annual plan.

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- The Committee met on October 13th and 14th, 2010 in New Orleans, Louisiana to receive sub-group reports and to draft the final recommendations of the Committee.
 - The Committee met via teleconference on October 21, 2010 in Washington, D.C. to complete final approval of the Committee report in accordance with the deadline set by the Secretary and conveyed through the Designated Federal Officer.

EPACT Subtitle J “Section 999” sets the funding for the overall program at a level of \$50-million-per-year over 8 years, provided from Federal lease royalties, rents, and bonuses paid by oil and gas companies. Of this, \$37.5 million is awarded for the consortium research and development program administered by RPSEA and \$12.5 million for the Complementary Program administered by NETL. The RPSEA program is broken into the Ultra-Deepwater (\$14.493 million), the Unconventional Gas (\$13.854 million), the Small Producer Program (\$3.562 million) and funding for administration and oversight (\$5.437 million).

The URTAC Committee focused on the Unconventional Gas and the Small Producer Programs of the Consortium Program and the applicable portions of the NETL Complementary Program.

2.0 EXECUTIVE SUMMARY AND RECOMMENDATION HIGHLIGHTS

The Committee reviewed the 2011 Annual Plan and identified major areas requiring further discussion. Sub-groups were formed to submit findings and recommendations for these areas. The sub-group reports were distributed to the entire Committee and each was discussed by the Committee as a whole. Following this discussion, the entire Committee agreed on and drafted the findings and recommendations included in this report.

The Committee wishes to note that steps have been taken by both NETL and RPSEA to implement many of the past recommendations of the URTAC, specifically in the areas of program, technology transfer, knowledge management database as well as metrics and benefit assessment.

For the 2011 Annual Plan, the Committee has the following comments:

- The interest shown by the current Administration in the Department of Energy's (DOE) Section 999 Research and Development (R&D) programs is itself a major change in focus that is very welcome news to the Committee.
- The Committee recognizes that the DOE is proposing a major shift in focus to more substantively address safety and environmental concerns. However, we believe that a balance needs to be achieved between the intent of the Section 999 legislation under which the existing program has been carried out, and the change of emphasis being proposed by the DOE.
- The environmental concerns that have arisen because of the recent expansion of oil and gas activity into new onshore areas (such as the Marcellus) have given rise to issues that need to be addressed, researched, and resolved. We strongly agree that some of these issues are well suited to R&D award topics under the Section 999 program, but not to the exclusion of the existing program topics.
- Additional funding that is authorized under Section 999 should be requested by DOE. This would better enable the pursuit of additional research topics specifically focused on environmental and safety, and also allow an increase in emphasis on environment and safety within existing projects, without detracting from the core elements of the existing program.
- The Committee believes that the following areas deserve a higher priority in the research program: well isolation and integrity, water use and re-use of produced, flowback, and frac waters, and methods to reduce air quality impacts.
- The Committee recognizes the need for a more modern and accessible knowledge management database and a robust Technology Transfer program as being critical to the success of the Unconventional Resources and Small Producer programs.
- The Secretary requested recommendations from URTAC regarding the relative importance of planned focus areas. The prioritization can be found in the Appendix.

3.0 TOPICAL REPORTS

The Advisory Committee developed their analysis of the 2011 Annual Plan through a series of meetings and sub-groups (as outlined in Section 5.0: Sub-Group Topics and Member Assignments). There are four areas of findings and recommendations:

- Policy
- Environmental and Regulatory
- Research
- Technology Transfer / Public Outreach

Treatment of Non-Consensus

In situations where members were divided on agreement with specific recommendations or statements in the report, 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.

In this report, there is one Minority Opinion.

3.1 POLICY FINDINGS AND RECOMMENDATIONS

The interest shown by the current Administration in the Department of Energy's (DOE) Section 999 Research and Development (R&D) programs is itself a major change in focus that is very welcome news for working to develop secure domestic energy supplies. The 2005 Energy Policy Act provided legislation for an eight year program as a means to provide stability for R&D programs by eliminating the threat of termination of funding that was inherent with the annual budgeting process.

With regards to the major change in program focus that is being proposed by the DOE in their 2011 Annual plan, we believe that a balance needs to be achieved between the intent of the Section 999 legislation under which the existing program has been carried out, and the change of emphasis being proposed by the DOE. We encourage the DOE to support their own recommendations with increased budgets and developing other areas of their programs (core and complimentary). We believe that the basic R&D programs now funded by Section 999 should be true to the legislation by retaining the breadth of the program as supported by the overarching objectives, albeit with an increase in environmental and safety focus.

This DOE program can provide through sound science the optimum balance between the need to support a crucial domestic energy industry, enhance the safety of its operation, protect the environment, and inform the regulatory process. The DOE's knowledge and unique perspective is of tremendous value to all stakeholders.

Finding #1

The DOE is requesting a "significant change in emphasis within the framework of the Overarching Objectives" (2011 Annual Plan, page 16). The DOE's 2011 Annual Plan proposes a major shift in focus to more substantively address the safety and environmental concerns.

The environmental concerns that have arisen because of the recent expansion of oil and gas activity into new onshore areas (such as the Marcellus) have given rise to issues that need to be addressed, researched, and resolved. We strongly agree that some of these are issues are well suited to R&D award topics under the Section 999 program, but not to the exclusion of the existing program topics.

Recommendations

The Committee fully supports the Overarching Objectives of the UCR program as stated in the 2011 Annual Plan on pages 15-16.

- *Increase Production and Recovery in an Environmentally Sound Manner:* Develop tools, techniques, and methods that substantially increase, in an environmentally sound manner, commercial production and ultimate recovery from established unconventional gas formations and accelerate development of existing and emerging unconventional gas plays.

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- *Reduce Environmental Impact:* Develop tools, techniques, and methods that substantially decrease the environmental impact of unconventional gas development with particular emphasis on water management and operations footprint.
 - *Encourage Demonstrations of New Technology:* Integrate the results and deliverables of the existing portfolio of projects to encourage industry to demonstrate and apply new technologies to enhance safe and environmentally responsible production of the domestic unconventional gas resource base. Successful technology transfer is an important component of this objective.
 - *Develop Technologies to Enable Environmentally Responsible Development of Emerging Gas Plays:* Develop techniques and methods for exploration and production from high priority emerging gas shales, coal, and tight sand fields, as well as frontier basins and formations, where these operations have been hindered by technical, economic, or environmental challenges.

All R&D projects and technology transfer efforts should continue to include the improvement of safety and the minimization of environmental impacts. This should be included as a criterion of the selection process and a metric of the success of the program.

- A greater share of the projects should continue to address environmental and safety concerns; however, in no way should these become the sole emphasis.
- R&D on environmental, health, safety, and regulatory topics that serve to address issues that are challenges to environmentally responsible oil and gas exploration, development, and production are of particular interest and should be pursued, whether under Section 999 or through other DOE programs. The objective of increasing domestic oil and gas reserves and production is the principal metric used to evaluate the program.

Finding #2

The support of the current Administration for the Department of Energy's (DOE) Section 999 Research and Development (R&D) programs is very welcome news to this committee. Continuity of funding is necessary to achieve maximum benefits from the research. The recommended expansion in the scope of the research will require more funding.

Recommendations

DOE should request additional funding that is authorized under Section 999. This would better enable the pursuit of additional research topics specifically focused on environmental and safety, and also allow an increase in emphasis on environment and safety within existing projects, without detracting from the core elements of the existing program. RPSEA states in the 2011 Draft Annual Plan that "roughly \$58 million in qualifying projects that were not funded represents a resource of work that could be initiated rapidly to have a near-term impact on the nation's energy supply."

3.2 ENVIRONMENTAL AND REGULATORY FINDINGS AND RECOMMENDATIONS

We support the recognition that potential positive and negative environmental impacts must be identified, and appropriate plans and technologies must be in place to promote, prevent, or mitigate them.

Finding #1

The Program is well suited to identify the key issues that pose a threat to the environment, to contribute to the development of technologies to exploit these resources and to help develop and demonstrate new approaches to lessen the environmental impacts. Part of the identification work may be better suited for DOE's Complementary Program rather than through an industry-led consortium.

Many real and perceived environmental and safety concerns can be dealt with through appropriate regulation and enforcement. Sound science can inform practice and policy.

Recommendations

The environmental mission is broader than what can be accomplished by Section 999. DOE should provide funding for environmental research to NETL and other institutions to strengthen its program and help provide independent analysis. This effort should include research in all of the key geographic areas to reflect their unique environments.

RPSEA should put greater emphasis on identifying technologies that help balance the objective of improving unconventional resources production with the objective of reducing environmental impacts of production.

The most valuable role the Unconventional and Small Producer programs (and other DOE oil and gas research programs) is to provide good, sound science that can inform practice and policy.

- DOE should direct RPSEA to specify that proposals, where applicable, include a description of the potential environmental impacts of the apparatus or method that may result from the proposed research. Such impacts may be positive or negative or both.
- DOE benefits assessment of each completed project should be expanded to include environmental impacts.
- Research should be pursued that determines the benefits and limitations of current mitigation options and identifies those that may optimize co-benefits to the industry and environment.
- DOE should clarify the jurisdictional statement in the last paragraph on page 17 of the 2011 Annual Plan.

Finding #2

The DOE Plan places increased emphasis on environmental risk identification, prevention, and mitigation.

Recommendation

RPSEA should be directed to strive to include specific efforts to more fully define any risks associated with unconventional gas development and to ensure that appropriate technologies are available to mitigate those risks [modified from RPSEA Draft Annual Plan, Description of Planned Solicitations, page 61].

3.3 RESEARCH PROGRAM FINDINGS AND RECOMMENDATIONS

A major shift in focus, not accompanied by additional funds, will result in less research directed toward achieving the stated goal of EPAct, Title IX, Subtitle J, “The Secretary shall carry out the activities under section 999A, to maximize the value of natural gas and other petroleum resources of the United States, by increasing the supply of such resources, through reducing the cost and increasing the efficiency of exploration for and production of such resources, while improving safety and minimizing environmental impacts.”

Finding #1

Research funded from this program has always included environmental and safety aspects. Not only have the projects funded included components of environmental and safety, others have been exclusively focused on these issues, such as:

- Environmentally Friendly Drilling Systems Program
- Pre-Treatment and Water Management of Frac Water Re-Use
- An Integrated Framework for the Treatment and Management of Produced Water

Recommendations

The Program should better communicate past project environmental and safety accomplishments.

Program research proposals should include statement of environmental and safety benefits.

Environmental and safety aspects should become a formal part of the selection committee criteria.

Finding #2

The Committee believes that the following areas deserve a higher priority in the research program:

- Well isolation and integrity (e.g. cementing, swellable packers, and evaluation of the effectiveness of the isolation)
- Water use and re-use of produced, flowback, and frac waters
- Alternate (non-flare) well testing methods to reduce cost, risk, and air quality impacts (liquefaction, compression, etc.)
- Air emissions

Other areas of importance are:

- Minimize surface impact
- Resources in frontier areas
- Other unconventional resources (oil-prone shale, tight sands and carbonates, and others)
- Production optimization and recovery enhancement utilizing methods to identify static and dynamic (over time) sweet spots
- Technologies which would encourage more use of stranded natural gas

The DOE 2011 Annual Plan places considerable emphasis on gas shale plays and neglects to consider other resources such as:

- Mature fields
- Oil producing shale
- Tight sands and carbonates, etc.
- Low BTU gas

Recommendation

There is a need for more research into the topics listed above.

3.4 TECHNOLOGY TRANSFER / PUBLIC OUTREACH FINDINGS AND RECOMMENDATIONS

The Unconventional Resources Technical Advisory Committee (URTAC) recommendations addressed the need for a more modern and accessible knowledge management database and a robust Technology Transfer program as being critical to the success of the Unconventional Resources and Small Producer programs.

Finding #1

The Petroleum Technology Transfer Council (PTTC) has been working within the producing regions of the country. While the PTTC has heretofore focused on a regional approach, the need to disseminate information at the national level is proving to be more challenging. RPSEA has held several stand alone symposiums dealing with the presentation of the various research projects and has had some reviews of the individual research projects.

Recommendations

RPSEA needs to accomplish their technology transfer requirements through groups such as PTTC. Technology transfer events should be held in diverse geographical areas, including areas with emerging oil and gas activity, and target a more diverse audience of stakeholders. RPSEA and PTTC should endeavor to hold more technology transfer events in conjunction with other major technical conferences.

Technology transfer should continue to the end of the Program for each project.

DOE, through its Complementary Program with PTTC or other groups, should:

- Seek to complement existing private sector/academic training in general oilfield safety, regulatory, and environmental requirements.
- Provide to the general public a clearing house of information on various oil and gas issues. This could be used to provide information on continuing research and important technology changes that may be of interest to regulators and other stakeholders.

DOE should assign “Outreach Coordinators” to work with oil and gas producers and state agencies to help inform the regulatory process.

Finding #2

In the 2007 URTAC Committee’s report, a Web based system was identified as needed to disseminate research and development activities, lessons learned and knowledge management around Unconventional Resources and Small Producer Programs (Section 999) to those communities. As a result, the knowledge repository was created (www.netl.doe.gov/KMD) by NETL. This repository is a significant resource to all stakeholders (oil and gas, environmental, regulatory, and others).

Recommendations

The Knowledge Management Database needs to be made to be more user friendly to allow a quick logon, preferably with a synopsis as to the content of the research, and associated websites to determine what other material might be out there.

DOE should require a disclaimer to be part of the presented results of all funded research. In addition, researchers should strive to report results in peer reviewed forums.

4.0 COMMITTEE MEMBERS

<u>Title</u>	<u>Last Name</u>	<u>First Name</u>	<u>Employer</u>	<u>City</u>	<u>State</u>
Mr.	Arthur	J. Daniel	ALL Consulting, LLC	Tulsa	OK
Dr.	Botkin	Daniel B.	Center for the Study of the Environment	New York	NY
Mr.	Bromfield	Kenneth	Dow Hydrocarbons and Resources, LLC	Houston	TX
Dr.	Brown	Nancy J.	Lawrence Berkeley National Laboratory	Berkeley	CA
Mr.	Camp	Wayne K.	Anadarko Petroleum Corporation	Woodlands	TX
Ms.	Cavens	Jessica J.	EnCana Oil & Gas (USA)	Denver	CO
Mr.	Daugherty	William S.	NGAS Resources, Inc	Lexington	KY
Mr.	Dwyer	James P.	Baker Hughes	Houston	TX
Mr.	Hall	J. Chris	Drilling & Production Co.	Torrance	CA
Mr.	Hall	Jeffrey D.	Devon Energy Corporation	Oklahoma City	OK
Dr.	Hardage	Bob	University of Texas at Austin	Austin	TX
Mr.	Harju	John A.	Energy & Environmental Research Center	Grand Forks	ND
Mr.	Kleinberg	Robert L.	Schlumberger-Doll Research	Cambridge	MA
Mr..	Lewis	Fletcher S.	Rainmaker Oil & Gas	Oklahoma City	OK
Ms.	Mall	Amy	Natural Resources Defense Council	Boulder	CO
Dr.	Martin	John P.	New York State Energy Research and Development Authority	Albany	NY
Mr.	Mason	Gregory	The Energy Cooperative	Newark	OH
Dr.	Mohagheh	Shahab D.	West Virginia University	Morgantown	WV
Mr.	Nilson	Gary J.	Pioneer Natural Resources USA, Inc,	Denver	CO
Mr.	Oglesby	Kenneth D.	Acorn Resources, Inc.	Tulsa	OK
Mr.	Rodgers	Brady D.	New Frontier Energy, Inc.	Denver	CO
Mr.	Sparks	Don L.	Discovery Operating, Inc.	Midland	TX
Mr.	Whitney	Sam W.	Shell E&P Company	Houston	TX

5.0 SUB-GROUP TOPICS AND MEMBER ASSIGNMENTS

At the September 9th, 2010 meeting in Sugar Land, Texas the following Subgroups and Schedule were established for developing the Subgroup analyses and reports. At the Committee meeting in New Orleans, Louisiana on October 13th and 14th, the “2011 Program” was reviewed and incorporated into this final report.

Schedule

9/9 – Subgroups establish and leaders defined
9/13-10/7 – Subgroup conference calls and E-mail correspondence
10/7- Subgroup reports to Chair
10/11- Subgroup reports distributed to Committee
10/13-10/14– Meeting in New Orleans
10/21- Teleconference and formal vote on final URTAC Report

Six Sub-Group Areas of Analysis and Member Assignments:

Executive Summary, Editing:

Lead – J. Hall
Members - C. Hall, Dwyer, Mason, Whitney

Research Program:

Lead – Dwyer, Mohaghegh
Members – Sparks, Oglesby, Lewis, Camp, Harju, Nilson, Mall, Brown, Rodgers

Policy:

Lead – C. Hall
Members – Whitney, Oglesby, Daugherty, Arthur, Mason, Brown

Technology Transfer and Public Outreach:

Lead – Lewis
Members – C. Hall, J. Hall, Martin, Mason, Dwyer, Nilson, Rodgers

Environmental and Regulatory:

Lead – Arthur
Members- Martin, Kleinberg, Brown, Mall, Mason, Hardage, Dwyer, Cavens, Bromfield

6.0 APPENDIX A

The Secretary requested recommendations from URTAC regarding the relative importance of planned focus areas.

By an overwhelming majority, the following items were of the highest priority.

In the Unconventional Program: proposals to develop new technologies necessary to enable more efficient and environmentally benign development of unconventional natural gas resources.

In the Small Producer Program: proposals to develop novel methods that provide positive environmental benefits while extending the economic life of mature fields.

Corrections

- Water demands for shale gas wells may exceed 2-3 million gallons. Water use associated with some wells has exceeded 10 million gallons.
- Flowback is a process and should be referred to as such. Water returning from the well is produced water, which may include spent fracturing fluids and natural formation water.
- Under air quality, note that intentionally vented emissions (stranded gas) are also a concern, particularly those with large Global Warming Potential.
- Page 14, bullet point 2 implies that cementing and casing standards are non-existent and/or are not followed, neither of which is true. The last statement of the bullet should more accurately read "The public concern is that current standards for cementing and casing wells, as well as monitoring and enforcement of these standards by the states may need to be reviewed for adequacy to ensure that drinking water supplies are protected".
- Page 16, 2011 Solicitations: recommend changing "any onshore" to "any onshore unconventional" at 3rd and 4th bullets is too broad for unconventional reservoir research scope.
- Page 18, first sentence should read federal *and* state regulatory agencies
- Page 6, 2nd paragraph, remove the word *responsible*

7.0 APPENDIX B

Minority Opinion

Amy Mall and Dan Arthur strongly support the Department of Energy's proposal to increase substantially the program's emphasis on identifying and minimizing environmental impacts within current funding levels, consistent with the clear direction from the Energy Policy Act of 2005 that research, development, demonstration (RD&D) and commercial application of technologies carried out under this program include safe operations and environmental mitigation, along with exploration and production. Additional RD&D and commercial application of technologies focused on environment and safety are essential given the country's reliance on fossil fuels as we transition to a cleaner energy future. Any funding beyond current levels should have an emphasis on environmental mitigation and safety issues.