Unconventional Resources Technology Advisory Committee

Advisory Committee to The Secretary of Energy

December 18, 2013

The Honorable Dr. Ernest Moniz
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 *2014 Annual Plan* for the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research Program.

- We find this program has been remarkably successful in meeting its objectives.

- Research into oil and gas resources is still needed to meet the future demand for domestic energy. We strongly recommend continuing the Section 999 Program beyond the current 2014 termination date. It is important that technology transfer and public outreach regarding the program's research results continue.

- It is this committee's belief that there remains a role for independent advice in future activities including technology transfer and helping develop new programs.

- We continue to seek efficient development and production technologies that increase oil and gas supplies while reducing environmental and safety impacts.

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 *2014 Annual Plan* consistent with the guidance outlined in our report.

Respectfully submitted,

Jessica J. Cavens

Jessica J. Cavens, Chair

Unconventional Resources Technology Advisory Committee

Comments and Recommendations 2014 Annual Plan

December 2013

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1.0 INTRODUCTION

The Unconventional Resources Technology Advisory Committee (URTAC) was formed in accordance with provisions of Title IX, Subtitle J, 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 of 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 999D(a) 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 in July 2012. Key milestones for the Committee included:

- Committee members received the initial Draft 2014 Annual Plan on September 6, 2013.
- Committee members met via teleconference on September 19, 2013. The agenda included a status update and overview of the onshore elements of the Section 999 Complementary Research Program by National Energy Technology Laboratory (NETL), and an overview of the Section 999 Program cost-shared research portfolio by RPSEA. The Chair appointed sub-groups to work on sections of the plan.
- During the period from September 20th through November 13th, the appointed sub-group members conducted several meetings by teleconference and E-mail to develop and consolidate recommendations regarding the draft annual plan.
- The Committee met via teleconference on December 4, 2013 to receive sub-group reports and to draft the final recommendations of the Committee.
- The Committee met via teleconference on December 18, 2013 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 999H 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 collected by the Department of the Interior. 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-administered 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 *2014 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 and technology transfer.

For the 2014 Annual Plan, the Committee has the following comments:

- Long-term research and development (R&D) is valuable and necessary. This often cannot be done by independent producers who are responsible for a large portion of the current oil and gas development in the United States. Subtitle J of the Energy Policy Act of 2005 has provided steady funding for the long-term cooperative research required to make progress toward safe and efficient development of the gas shale resource base. We have found this approach to be much more efficient than intermittent funding which depends on annual appropriations.
- The Section 999 research program created two very strong advisory committees to help provide independent guidance to the program planning process. Though the funding cycle for new R&D projects has ended, work continues on the legacy 999 projects and the related non-999 projects. It is this committee's belief that there remains a role for independent advice in future activities including technology transfer and helping develop new programs.
- Technology transfer associated with the Subtitle J research program has been extremely valuable in achieving production, environmental, and safety goals. If Subtitle J program concludes, it is important that technology transfer and public outreach regarding the program's research results continue beyond the sunset date.
- Refocus the R&D component of Subtitle J to include other unconventional resources such as tight oil, and oil shale. Also include projects on increasing reservoir recovery in existing reservoirs.
- Pursue research and communication among multiple government agencies and industry that addresses concerns specific to the exploration and production of natural gas from shale deposits and other unconventional resources.
- The Section 999 program has been very productive and well worth the investment. A sub-committee to provide a thorough analysis of the entire program has been formed and a formal report from the entire committee will be issued and submitted to the Secretary of

Energy by July 2014. The information contained in the report could be used in R&D designing future programs.

- Improving safety and minimizing environmental impacts is synergistic with improving operational efficiency and reducing the cost of oil and gas production. Providing sound science contributes to the optimum development of a domestic energy supply while enhancing the safety of its operation, and protecting the environment. Technical innovations that support all of these goals should be more rapidly adopted.

3.0 TOPICAL REPORTS

The Advisory Committee developed their analysis of the 2014 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
- Research & Development
- Environmental & Safety
- Technology Transfer
-

Treatment of Non-Consensus

All findings and recommendations reached consensus.

3.1 POLICY FINDINGS AND RECOMMENDATIONS

- Successful execution of this research and development 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.

- Independents are faced with unique and ever more difficult technical challenges in developing new unconventional resources, yet they often lack the means to undertake R&D. Therefore, the federal government should continue to provide leadership and to help fund and disseminate the results of R&D programs for public benefit.

- The Committee strongly recommends that the program reach out broadly to all liquid-rich producing and potentially productive regions of the United States, including the West coast, West Texas, and the Williston Basin.

- The Department of Energy (DOE) needs to proactively provide information that can be used in federal, state and regional decision-making processes that may aid in the development of oil and gas resources, to ensure that larger national energy needs are taken into account.

- Oil and gas will continue to provide a significant amount of energy to the United States during the foreseeable future, even with significant efforts to increase alternative and renewable resources. Therefore, every effort must be taken to ensure that petroleum resources are developed to the most efficient and environmentally responsible extent possible.

- The federal government oil and gas research and development and Technology Transfer (TT) programs are extremely important for maximizing domestic production for many reasons: (1) federal programs serve to develop and transfer technologies that are non-proprietary and thus are available to all, including both the public and producers; and (2) as a major landowner and tax recipient, the government should actively manage its minerals and revenue streams. Participating in R&D and ensuring the effectiveness of TT mechanisms is an important undertaking to fulfill this responsibility and to be an effective steward.

Finding: SECTION 999 PROGRAM MET OBJECTIVES

Section 999 of the Energy Policy Act of 2005 has been a mechanism for providing long-term cooperative research with the steady funding required to make progress toward the development of a safe and efficient gas shale industry. We find this program has been remarkably successful in meeting its objectives. We believe this approach to be much more efficient than intermittent funding which depends on annual appropriations.

The Section 999 program has functioned as envisioned:

- The program provided a stable funding source with which the Department of Energy could invest in helping to seed and transfer technology enabling new development and operating concepts while being more environment, safety and health sustainable and robust.
- Mid and long term programs and projects can be planned and executed without threats of annual shutdowns or cutbacks while funding sources were uncertain.
- The funding is less vulnerable to the vagaries of annual appropriations debates and the changes in direction imposed by political agendas.
- Program management by RPSEA has successfully advanced the goals of the program
- Completed Section 999 projects continue to contribute to the growth of the gas shale development.
- We agree with the Secretary of Energy Advisory Board Shale Gas Production Subcommittee 90-day report finding supporting the Section 999 research program. Section 999 is in fact long-term and is not designed to respond to short-term issues.

Recommendation:

The DOE should:

- Recap the accomplishments and recommend to Congress to amend Section 999F to change the “sunset” to extend the program for ten years.
- Request additional funding as authorized under Section 999H.
- Incorporate management framework from the present program to renewed program.

Finding: ENSURE THAT OTHER PETROLEUM RESOURCES ARE INCLUDED

The focus on unconventional gas resources has resulted in significant advances in the production of this resource. While there are challenges that remain to be addressed, there are other unconventional resources that would greatly benefit from the research, development and technology transfer of the DOE R&D programs.

Under the current program, only a limited number of projects address oil reservoirs. Focusing on R&D projects in these areas would help reduce dependence on imported foreign crude oil.

Some examples are:

- DOE should include research directed towards these other main resource areas: 1) both gas and liquid petroleum resources and 2) unconventional reservoirs other than shale, such as low-permeability ("tight") sandstone and carbonates, and 3) other potential oil and gas resources

- The DOE Section 999 program has not focused on any West Coast resource during this program; yet one of the largest reservoirs, Monterey shale, is located in California. Identifying bypassed oil in older fields; developing improved recovery methods.

An increase in recovery efficiency in existing reservoirs by just 10 percent would greatly add to the oil resource base at minimal cost.

Recommendation:

The DOE should:

- Refocus the R&D component of the Section 999 program to include other unconventional resources such as tight oil and oil shale.

- Enhance the Section 999 funding beyond unconventional resources to include projects on increasing reservoir recovery in existing reservoirs.

Finding: OIL AND GAS DEVELOPMENT HAS POSITIVE ECONOMIC IMPACT

Given that the current administration has claimed credit for the creation of numerous jobs and that the creation of one million new jobs in the oil and gas industry plus another one million associated jobs in manufacturing[1] could be created within the next ten years by more favorable policies in the energy sector, including the extension of research such as is currently being conducted via the Sec. 999 unconventional energy research programs.

Recommendation:

The DOE should:

- Recommend that the Section 999 be extended to further develop means of developing low cost cleaner burning hydrocarbons that would further increase the benefits of our natural gas, help reduce imports of oil from other external sources, and job creation.

[1] EnergyFromShale.org

3.2 RESEARCH AND DEVELOPMENT FINDINGS AND RECOMMENDATIONS

Finding: DETERMINE METRICS AND PROGRAM VALUE

As noted in previous URTAC reports, the Subtitle J research program has significant value that has encouraged exploitation of unconventional fossil fuel resources. In order to make a tangible assessment, quantitative metrics need to be developed and applied. The use of incremental production, or royalties from production on federal lands, as sole measures of program success, is inadequate. We find that metrics like these are unduly narrow in light of the mandate from DOE for Subtitle J activities to improve the environmental sustainability and safety of exploration and production operations. These metrics do not adequately capture the value of many long term research projects and the educational value of the program.

In the enabling legislation, the program's goals were laid out quite simply in Section 999B: "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." In 2007, The General Accounting Office (GAO) issued GAO-08-190R DOE's Oil and Natural Gas R&D that identified a series of targets for the USDOE research program which included very similar targets, including support for independent producers, less dependence on foreign oil, increased government revenues from royalties and taxes, gas research projects that help to replenish the talent pool of energy professionals, and reducing the environmental impact of oil and natural gas activities. Any serious attempt to capture the value of the program must be considerate of the broad mandate in the legislation, subsequent assessments and planning approaches.

The DOE and the industry have a vested interest in capturing the value of the program since this will help guide future research efforts moving forward. Again, the 2007 GAO report describes the imperative: "While GAO and others have reported that the overall benefits of these projects have been difficult to quantify and link to DOE's efforts, considering key questions about the need for research, industry commitment to research, and the costs and benefits associated with the research can help define the role of the federal government and assist the Congress in its policy choices." We feel that the program has helped answer these questions: the research here has been relevant; industry is willing to commit to a cost-shared research program, and the federal government has a significant role in this type of research.

Recommendation:

The DOE should:

- Use the enabling legislation, annual plans and the 2007 GAO report as a guide to evaluate the benefits of the program towards advancing domestic oil and gas production.
- Identify a suite of metrics that can help identify the degree of market penetration by the program including how many technologies have been commercialized, how many reports have been published, cited, etc.
- Conduct industry surveys to identify how successful stakeholders feel the program has been at meeting the goals set forth in Section 999.
- Approach and timeline for conducting this analysis to be completed before the committee sunsets.

Finding: FUTURE DOE R&D FUNDING

The DOE needs to continue funding Section 999-type research since much work remains to be done. Research based on sound science is necessary to help identify new reserves, produce these at a reasonable cost and with reduced environmental impacts. Other concerns moving forward include the ability to migrate new technology to scale up, building enough equipment and training enough workers.

In earlier DOE annual plans, there was an emphasis on demonstration of technology. In the later portion of the program the DOE put more emphasis on environmental issues. Though we realize the importance of this redirection, the lack of demonstration projects in the last years of the program impacted the ability to scale up and commercialize developed technology.

Recommendation:

The DOE should:

- Develop future research programs that target areas of great national importance such as enhanced oil and gas recovery, hydraulic fracturing fluid design, disposal and treatment, and novel water reuse technologies such as processing for irrigation.
- Consider the need for more demonstration programs to help the scale up of technologies developed through DOE research.

Finding: PROGRAM STRENGTHS AND WEAKNESSES

There are numerous state and federal research programs and each take a slightly different approach to meeting their goals and objectives. The Section 999 research program was unique in the organization, the degree of public private cooperation and the funding mechanism. To help improve future research programs, some consideration of the positive and negative attributes of this approach is important.

This committee feels that the program's positive attributes include the multi-year funding continuity, consistent budget funding levels, and the support for industry cooperation with national labs, academia, and governments. The most glaring negative attribute was the incredibly slow contracting process even though the point of the program organization was to free the contractor from DOE's bureaucracy, an outcome achieved with the Stripper Well Consortium.

Recommendation:

The DOE should:

- Identify the most successful attributes of the program that can be replicated in future DOE programs.
- Identify the benefits and limitations of the current program.
- Modify the program to optimize performance.
- Evaluate program conduct, content and consistency with the enabling legislation.

Finding: ROLE OF THE ADVISORY COMMITTEES IN FUTURE R&D PROGRAMS

The Section 999 research program created two very strong advisory committees to help provide independent guidance to the program planning process. Though the funding cycle for new R&D projects has ended, work continues on the legacy 999 projects and the related non-999 projects. It is this committee's belief that there remains a role for independent advice in future activities including technology transfer and helping develop new programs.

Recommendation:

The DOE should:

- Continue to utilize federal advisory committees such as this one moving forward to advise on oil and gas research activities.

3.3 ENVIRONMENTAL AND SAFETY FINDINGS AND RECOMMENDATIONS

Finding: FEDERAL RESEARCH ON ENVIRONMENTAL AND SAFETY ISSUES

The Section 999 program has funded crucial research in the areas of environmental risks and impacts of oil and gas production, and technologies and practices to mitigate these impacts and risks. With the program established under the Energy Policy Act of 2005, Section 999, set to sunset in September 2014, the fate of future federal funding of these topics is uncertain.

Recommendation:

The DOE should:

- Continue pursuing research as part of the DOE/DOI/EPA multi-agency collaboration promoting unconventional oil and gas research.
- Develop and maintain a standing Energy Advisory Committee.

Finding: INTEGRATING ENVIRONMENTAL AND COMMERCIAL RESEARCH

New technologies and practices developed to improve oil and gas production can potentially have both positive and negative environmental and safety impacts. Research to address the commercial viability of a new technology may or may not include an assessment of such impacts. Should these technologies be developed commercially, their environmental and safety attributes should be assessed.

The 2014 Plan states that "…all projects in the Program will be evaluated for potential and ongoing environmental impacts as applicable, both positive and negative, to ensure that these impacts are fully understood during project selection and management."

Recommendation:

The DOE should:

- Continue to solicit projects that integrate environmental and commercial assessments of new technology.
- Solicit projects that focus on solutions to environmental and safety impacts that may be unique to natural gas liquids and unconventional oil development.

3.4 TECHNOLOGY TRANSFER FINDINGS AND RECOMMENDATIONS

Technology Transfer is one of the most important parts of the Section 999 program, because without it the results of the research and development would never be disseminated to the widest possible audience. In fact, the need for TT continues beyond the end of the program sunset in September 2014.

Finding: CURRENT PROJECT VISIBILITY

With the upcoming sunset of the Section 999 program less than one year from now (in September 2014), it is unlikely that the most recent research projects will be given the same exposure to the public and interested stake-holders as those generated earlier in the program.

Recommendation:

The DOE should:

- Make a concerted effort to disseminate the information generated by all research done to date. Special emphasis should be given to the most recent research project findings and conclusions. This effort should continue beyond the sunset date of the program.

Finding: DATA ARCHIVAL

The results of the research and development conducted needs to be archived in a manner such that it remains readily available and visible.

Recommendation:

The DOE should:

- Ensure that the technical information in the Knowledge Management Database system developed by the DOE (www.netl.doe.gov/KMD), is packaged and disseminated in a useable format (both digital and hard copy as appropriate) to general public, environmental groups, trade associations, industry technology transfer groups, professional societies, scientific libraries, and major petroleum educational institutions . The information should be web optimized so that web browsers will pick up appropriate links independent of original gateway.

Finding: TECHNOLOGY TRANSFER IS AN ONGOING INITIATIVE

Technology Transfer is one element of R&D that should have a life beyond the sunset of the program. Only by ensuring that this is accomplished will the maximum benefits and return on the investment in the Section 999 program be fully realized. Furthermore, future R&D efforts (whether conducted by industry or government agencies) will depend upon existing technology transfer frameworks to disseminate information derived from their programs. This point has been stressed repeatedly by this committee during the past 9 years:

- All TT should be a 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.
- For any R&D program to be successful, its TT component must be implemented early, coordinated and used often.
- Partnerships with existing TT mechanisms (i.e.: especially recognized programs such as the Petroleum Technology Transfer Council) should be encouraged, thereby ensuring that they are in place to carry out the TT needs of this and future programs.

Recommendation:

The DOE should:

- Devise a plan and resources to transition the TT conducted as part of the Section 999 program to be part of an on-going and active program within the DOE beyond the sunset date of the 999 program.

4.0 COMMITTEE MEMBERS

Title	Last Name	First Name	Employer	City	State
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.	BlackRidge Resource Partners LLC	Lexington	KY
Mr.	Dwyer	James P.	Baker Hughes	Houston	TX
Mr.	Hall	J. Chris	Drilling & Production Co.	Torrance	CA
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
Dr.	Martin	John P.	JP Martin Energy Strategy, LLC	Saratoga Springs	NY
Mr.	Mason	Gregory	The Energy Cooperative	Newark	OH
Dr.	Mohaghegh	Shahab D.	West Virginia University	Morgantown	WV
Ms.	Mordick	Briana	Natural Resources Defense Council	San Francisco	CA
Mr.	Nilson	Gary J.	TransAtlantic Petroleum, Ltd.	Addison	TX
Mr.	Oglesby	Kenneth D.	Acorn Resources, Inc.	Tulsa	OK
Mr.	Sparks	Don L.	Discovery Operating, Inc.	Midland	TX

5.0 SUB-GROUP TOPICS AND MEMBER ASSIGNMENTS

At the September 18, 2013, virtual meeting the following Subgroups and Schedule were established for developing the Subgroup analyses and reports. At the virtual Committee meeting on December 4, 2013, the Subgroup reports were reviewed and incorporated into this final report.

Five Sub-Group Areas of Analysis and Member Assignments:

Policy
Cavens, Dwyer, Hall, Martin, Mason, Nilson (chair)

Technology Transfer
Dwyer, Hall (chair), Lewis, Mason, Nilson

Environmental & Safety
Brown, Camp, Kleinberg, Mordick (chair)

Research and Development
Brown, Dwyer, Harju, Lewis, Martin (chair), Mohaghegh, Sparks

Editing
Cavens, Dwyer (chair), Mason