The Ultra-Deepwater Advisory Committee

Advisory Committee to The Secretary of Energy Established Under EPAct 2005 Section 999D

October 22, 2009

The Honorable Steven Chu
Secretary of Energy
Washington, D.C. 20585

Dear Mr. Secretary:

On behalf of the Ultra-Deepwater Advisory Committee (UDAC), I am pleased to submit the results of our review of the Ultra-Deepwater Program (UDW Program) element of the Draft 2010 Annual Plan for the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program (the Plan).

The Committee recognizes the accomplishments of the management team (DOE, NETL, and RPSEA) in creating the Plan and implementing EPAct (the Program) to date. The network of industry experts represents:

- 145 organizations,
- 27 states, the District of Columbia, and the Province of Newfoundland, Canada,
- collectively more than 600,000 employees world-wide; and
- more than 50% of U.S. natural gas and oil production

This network has been particularly effective in identifying the research opportunities with the greatest potential to impact the development of new technology required to develop the oil and gas resources in the U.S. ultra-deepwater in a safe, cost effective and environmentally responsible manner.

There are multiple benefits of this research for consumers, the economy, and national security. The UDW Program supports industry efforts to increase and further develop the domestic resource base in the United States. This will help provide a robust, diverse, and affordable supply of energy in the United States that is not dependent on imports, and is essential to economic growth while being environmentally responsible. Domestic oil and gas supply will provide a critical bridge for America's transition to renewable energy sources in the future. Moreover, such domestic energy supplies provide America with a viable alternative to reduce environmental impact of CO_2 emissions associated with the importation of vast quantities of oil and gas. In addition, fewer imports translate into less fuel consumed with the transfer or transportation of energy.

New technology developed through this Plan promotes access to these resources and will enable the development of a workforce capable of filling new jobs created by ultra-

deepwater development. This includes research needed for safe infrastructure while protecting the environment. The cooperative nature of this government/industry/ academia program, with cost sharing by industry partners to develop and test new technology, brings together the best minds to attack these complex problems. From our Plan review, the UDAC is pleased to report a meaningful shift in private sector interest illustrated by cost sharing participation (50% industry and 50% nonprofit and universities to 67% industry 33% nonprofit and universities).

Industry has recently announced a significant discovery in ultra-deepwater Gulf of Mexico that reportedly could approach three billion barrels (i.e. Tiber). Conversion of this discovered resource into commercially proven reserves will require development of new technology and will become a substantive new federal, state and local revenue source. The UDW Program offers a unique collaborative environment for pioneering technology applicable to the ultra-deepwater arena. Technology developed through the UDW Program is publicly available, transferable, and would not otherwise be pursued in a timely manner.

The UDAC believes that DOE should work within the Administration to ensure that the Program is sustained, and that new technology is available when needed throughout the lifecycle of ultra-deepwater activity. DOE should commit fully toward reaching the objectives of the Program, through adequate funding for its full duration. It is important to acknowledge that the full value of the Program could be lost by premature cessation of funding.

Respectfully Submitted,

Kent F. Abadie
Chair – UDAC

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Comments and Recommendations

October, 2009

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1.0 INTRODUCTION

The Ultra-Deepwater Advisory Committee (UDAC or Committee) was formed pursuant to the provisions of Title IX, Subtitle J, Section 999D(a) of the 2005 Energy Policy Act (EPAct).

The Committee consists of:

- Individuals with extensive research experience or operational knowledge of offshore natural gas and other petroleum exploration and production; and
- Individuals broadly representative of the affected interests in ultra-deepwater natural gas and other petroleum production, including interests in environmental protection and safe operations.

The provisions of EPAct excluded Federal employees and board members, officers or employees of the Program consortium, known as Research Partnership to Secure Energy for America (RPSEA; or the Consortium).

The duties of the UDAC under EPAct Title IX, Subtitle J, Section 999D(a) are to advise the Secretary of Energy (Secretary) on the development and implementation of programs under Title IX, Subtitle J, related to UDW natural gas and other petroleum resources and to carry out section 999B(e)(2)(B) which is to comment on the draft annual plan.

The Committee was chartered July 2008, and members received letters of appointment from the Secretary signed August 14, 2008. See Section 4.0 for a list of Committee members.

The Department of Energy (DOE) Designated Federal Officer provided additional guidance for the Draft 2010 Annual Plan (the Plan) Review at the Eleventh Meeting of UDAC in San Antonio, TX on September 16-17, 2009.

The schedule of work for the review of the 2010 Plan included the following key milestones:

12-19-08 9th UDAC Meeting, Washington, DC: vote to establish 2 Standing Subcommittees: the UDAC R&D Portfolio Subcommittee, and the UDAC R&D Process Subcommittee

1-22-09 Meeting of the UDAC R&D Portfolio Subcommittee: reviews charter; determines strategy to use questionnaire to sort information on the portfolio of projects

2-6-09 Meeting of the UDAC R&D Portfolio Subcommittee: begins development of questions for use in sorting information on the project portfolio

3-24-09 Meeting of the UDAC R&D Process Subcommittee: reviews charter; discusses with NETL and RPSEA the process used by NETL and RPSEA from solicitation of proposals through award of subcontracts

4-15-09 Meeting of the UDAC R&D Portfolio Subcommittee: reviews RPSEA response to the questionnaire for the 2007 R&D Portfolio; discusses same with NETL and RPSEA; adjustments are made to the questionnaire

7-1-09 Meeting of the UDAC R&D Portfolio Subcommittee: reviews the additional information; discusses completed questionnaire with NETL and RPSEA

7-15-09 10th UDAC Meeting, Washington, DC: status update on the UDW Program and the NETL Complementary Research Program; reviews preliminary reports from the Portfolio Subcommittee and the Process Subcommittee

9-15/16-09 11th UDAC Meeting, San Antonio, TX: overview of the *2010 Annual Plan*

9-21-09 Meeting of the UDAC R&D Portfolio Subcommittee: reviews the 2010 Portfolio and requests the 'questionnaire' be applied to the 2008 Portfolio and the 2009 R&D Portfolio.

9-25-09 Meeting of the UDAC R&D Portfolio Subcommittee: discusses first draft of Subcommittee report; receives questionnaire response for the 2008 Portfolio; discusses the RPSEA Environmental Advisory Group function and project selection criteria with NETL and RPSEA;

9-28-09 UDAC R&D Portfolio Subcommittee members submit comments on draft Subcommittee report

9-28-09 UDAC R&D Process Subcommittee submits final draft report of findings and recommendations

10-5-09 Meeting of the UDAC R&D Portfolio Subcommittee: completes final Subcommittee report of recommendations

10-14-09 12th UDAC Meeting, Los Angeles, CA: review Subcommittee reports; develop final recommendations

10-15-09 Meeting of the UDAC Editing Subcommittee: develops first draft of final UDAC report on the *2010 Annual Plan*

10-16-09 UDAC Editing Subcommittee delivers draft for comment

10-19-09 UDAC members comment on first draft of final UDAC report

10-20-09 UDAC Editing Subcommittee delivers second draft of final UDAC report

10-21-09 UDAC members comment on second draft; final draft available for members

10-22-09 13th UDAC Meeting, Washington, DC: members vote to accept final UDAC report of comments and recommendations on the *2010 Annual Plan*

2.0 EXECUTIVE SUMMARY AND RECOMMENDATION HIGHLIGHTS

The UDAC recognizes the experience and expertise and wishes to thank the teams responsible for planning and executing the Ultra-Deepwater (UDW) Program: the DOE, National Energy Technology Laboratory (NETL) and Research Partnership to Secure Energy for America (RPSEA; or the Consortium).

Program metrics for the Plan are supported by the Committee. The Plan program metrics are as follows:

- *Issue and complete at least one solicitation;*
- *Select and award three to five large projects, with a value of $1 million to $5 million per project, with additional awards averaging $150 thousand - $300 thousand each; and*
- *Establish FY2011 program priorities based on results of 2007-10 solicitations and other inputs from stakeholders, including the program advisory committees and the UDAC.*

The UDAC authorized formation of two standing subcommittees (R&D Program Portfolio and Program Process) to further review focus areas of the 2010 Draft Plan. Details of the subcommittee findings are contained in this report. The following are highlights the Committee wishes to report.

Current Status and Program

In the 2009 Plan review, the Committee registered concern regarding the low number of contracts awarded for selected R&D projects. As a follow up, subcommittees identified and recommended actions associated with Program process improvement and communications. The results of these efforts are:

- Awards have reached the following levels: 17 for 2007 and 12 potentially for the 2008 funding.
- The mix of participants has expanded and altered from being almost evenly split 50% industry and 50% nonprofit and universities to being about 67% industry 33% nonprofit and universities. This shift illustrates genuine interest in the R&D program by private sector.
- The average of the individual awards has increased from approximately $850,000 to about $1,200,000. The increase in the size of the awards (or potential awards) is appropriate for the breakthrough technology.

Along with larger number of awards, cycle time for solicitation to award is also shortened from 12 months to less than 8 months with a desire to improve to a target cycle time of 7 months or less. Specific efforts to improve communication, education and standardization of the contracting process are key elements supporting this improvement.

Recommendation Highlights

- Greater attention should be devoted to environmental issues as they affect the industry infrastructure as well as natural environment. All projects are required to address specific environmental impacts. Consequently, the Committee suggests thorough review and assessment of the environmental content of the UDW program as well as enhanced transparency.
- Benefits assessment is an area critical to establishing the value and sustainability of the Program. Accordingly, this task should be assigned high priority to achieve implementation prior to the delivery of the 2011 Draft Annual Plan. Subsequently, benefit assessment methodologies should undergo continuous improvement.
- The Committee suggests external benchmarking be implemented to obtain a more comprehensive evaluation of Program performance. Internal benchmarking measures indicate satisfactory performance levels and DOE reports federally mandated audits revealed no material weaknesses.
- The R&D portfolio appears to be robust; however the EP industry operates in a dynamic environment. This operating environment requires flexibility in the R&D portfolio. Two significant areas requiring portfolio focus are well completions and low permeability reservoirs.

UDW Program Direction

Due to Program funding levels, the 2010 Plan reveals a significant narrowing of the R&D technology funnel. As projects move toward the field demonstration stage, current funding provisions may be insufficient in view of the high costs of technology evaluation and implementation in the UDW operating environment. Either additional funding sources need to be developed or the number of R&D projects reduced.

The Plan contributes to the primary Program goal of increasing the UDW resource base and converting discovered resources into proven reserves, which can be safely and economically recovered while protecting the environment. A critical success factor in the Program is to define "end game" strategies for each of the R&D projects and how they contribute and align with our national interests of energy security and independence.

The Committee feels EPAct Subtitle J delivers a compelling direction in support of UDW exploration and development critical to America's quest for domestic energy supply and federal, state and local revenue for the foreseeable future. The importance of domestic

energy supply is underscored by its environmental advantage of reduced CO_2 emissions, contributions to the domestic job market, and enhancement of U.S. technical capabilities for competing in the global marketplace.

3.0 SUBCOMMITTEE REPORTS

At the September 16-17 meeting, the UDAC agreed to divide the UDW Program element of the Draft 2010 Annual Plan for the UDW and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program (the Plan) and review the following focus areas:

- R&D Portfolio
- Program Process

Subcommittees were formed to assess the Plan for each of the two (2) focus areas and provided the review and recommendations to the Secretary.

3.1 R&D PORTFOLIO FINDINGS AND RECOMMENDATIONS

Overview

The Committee is pleased that many of the recommendations from the previous UDAC have been implemented. As stated in the Plan, the Ultra-Deepwater Program element concentrates on six major needs:

1. Drilling, Completions, and Intervention Breakthroughs
2. Appraisal & Development Geoscience and Reservoir Engineering
3. Significantly Extend Satellite Well Tieback/Surface Host Elimination
4. Dry Trees and Risers in 10,000 Feet Water Depth
5. Continuous Improvement and Innovation
6. HS&E Concerns (Health, Safety and Environmental)

The Portfolio Subcommittee analyzed the Ultra-Deepwater Portfolio of Projects (2007 and 2008 portfolios, and 2009 solicitations), largely based on a survey instrument developed by the subcommittee. The survey results were compiled and evaluated based upon the following criteria:

- Balance
- Barriers and Opportunities
- Diversity
- Value

Finding #1: Environmental Content

In general, the Committee finds the R&D project portfolio balanced after review of the 2007 and 2008 portfolios, and 2009 solicitations, noting that only two R&D projects in 2007 and 2008 are represented in the "environmental" category. Nonetheless, all projects are required to address environmental issues and concerns. The Committee recognizes the role of the RPSEA Environmental Advisory Group (EAG) in advising RPSEA on how UDW technology fits into the broader environmental research effort and where RPSEA can undertake work to fill research gaps. However, environmental aspects of each project have not been communicated effectively at the project level. Therefore, the adequacy of the overall environmental content of the entire portfolio cannot be determined.

It should also be recognized that there are two aspects of "environmental" considerations:

1. How the environment affects industry infrastructure.

2. How the infrastructure and associated deepwater activities affect the natural environment.

For example, the Ultra-Deepwater Program must be sensitive to issues of climate change while searching for technology that minimizes:

- How climate change could affect the industry (e.g. sea level rise, increasing storm intensity)
- How industry could affect climate change (e.g. green house gases, ocean acidification, global warming)

Understanding of environmental and ecosystem dynamics is critical to designing and operating the surface and subsurface infrastructure of the oil and gas industry. Understanding of the ecosystem dynamics, ecology, habitats, and living resources of the areas of activity is critical to protecting the natural environment and living resources and sustaining the ecological services provided.

Recommendation # 1a:

The Committee recommends that an overall assessment be conducted to ensure that the environmental content of the R&D portfolio is adequate, that the results of this assessment be communicated, and adjustments be made in the portfolio if appropriate.

Recommendation # 1b:

Both environmental aspects need to be considered and addressed in the R&D portfolio:

1. How the environment affects industry infrastructure
2. How the infrastructure and associated deepwater activities affect the natural environment.

Finding #2: Converting Discovered Resources into Proven Reserves

The portfolio is weighted toward conversion of discovered resources into economically recoverable proven reserves. The survey of the projects shows that only one research project (DW2001) is aimed at increasing the resource base, while most other projects are aimed at conversion of resources into proven reserves.

Comment #2:

The main UDW Program objective is to increase production and convert resources to reserves. Given the main goal of the Program is to increase production and royalties this seems reasonable.

Finding #3: Project Strategy Considerations

The Plan recommends a decrease in the number of projects to be funded with a corresponding increase in the funding level for each project. The Committee expects that this trend will continue as the UDW Program matures and demonstration projects become more common. Maturation of the R&D portfolio will naturally lead to a greater demand for funding and/or optimization of the portfolio through collaborations and leveraging.

Recommendation # 3a:

Determine "end game" strategies for each project in the R&D portfolio. These strategies should be defined in terms of:

- Research, development, demonstration, and commercial application of technologies for ultra-deepwater [Section 999A(a)]
- 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. [Section 999B(a)]

Recommendation # 3b:

Identify additional sources of funding to sustain Program progress ensuring that development of technologies meet "end game" strategies. As the R&D portfolio matures and as projects remain in the Program, funding will need to be increased or the number of projects reduced.

Recommendation # 3c:

Identify ultra-deepwater related activities that other agencies (e.g. USGS, EPA, MMS, etc.) are sponsoring to look for opportunities for collaboration and to avoid redundancy.

Finding #4: Benefits Assessment

NETL is developing benefits assessment methodologies by which the value of the UDW Program can be measured and evaluated.

Recommendation # 4:

Ensure this deliverable is operational and available for public view prior to issuance of the 2011 Draft Plan.

Finding #5: Well Completion R&D

The Committee recognizes that completions operations are essential to successful development of ultra-deepwater resources and represent a major cost element. Inadequate focus has been given to well completion projects.

Recommendation # 5:

Develop and maintain a robust presence of completions projects in the portfolio.

Finding # 6: Low Permeability Reservoir R&D

There is a lack of projects addressing discoveries in ultra-deepwater reported to have low permeability reservoir rock (e.g. stimulation). R&D projects are primarily focused on cost-reduction rather than reservoir productivity.

Recommendation # 6:

Consideration should be given to pursuing R&D projects which would enable reservoir characterization and stimulation techniques such as hydraulic fracturing and acidization in ultra-deepwater to improve expected reservoir productivity in low permeability reservoirs.

3.2 PROGRAM PROCESS

Overview

The Committee feels that the overall process of solicitations and awards is maturing and showing great improvement. The variety of project awards and the increase in the number of participants demonstrates the efficacy of the process. The projects included in the Complementary Research Program demonstrate good communication pathways between the NETL and RPSEA. The electronic reporting of solicitations, awards, and projects, including technology transfer assist in making the UDW Program transparent to industry and the public.

From the number of companies involved in currently awarded projects and those selected for awards, it is possible that the future funding may be made available through greater private sector cost sharing; driven by successful demonstration that minimizes risk and offers commercial viability.

Finding #1: Speed of Awards

The speed at which projects are reviewed and awards given is critical to the overall success of the effort. The time period from solicitation to award has decreased from over one year to less than 8 months during the last three years. This improvement has been achieved through application of "standard contracts" and review process enhancements made by NETL and RPSEA. Formal/informal training and support efforts of both organizations help potential proposers understand the solicitation and award process. The award cycle time is expected to decrease even further as follow-up projects or new projects proposed by groups with former UDW Program experience are solicited and approved for award.

Recommendation #1:

The Committee recommends the DOE **continue** the following practices:

- Utilize standard contracts.
- Engage with stakeholders.
- Catalog successes and failures and share "learnings" with stakeholders.
- Identify new opportunities for improvements in the award process and communicate to stakeholders.

Finding #2: Health, Safety, & Environment (HS&E) Communication

General awareness of Health, Safety, and Environmental issues will continue to be a major driver in the vetting process for new technologies as they emerge and are commercially developed. Associated Safety and Environmental Concerns (Need 6 of the Plan) are under communicated in the information available to the industry and public about the HS&E content of proposals and awards.

Recommendation #2:

The Committee recommends project progress reports include considerations/findings related to HS&E, and improved communication to the public and industry of the Associated Safety and Environmental Concerns addressed by the projects awarded or selected for award.

Finding #3: Benchmarking

A review of the Program process demonstrates progress as indicated by the following internal benchmarking findings:

- The number of awards has increased from previous Plan review: 17 for 2007 and 12 potentially for the 2008 funding.
- The mix of participants has expanded and altered from being almost evenly split 50% industry and 50% nonprofit and universities to being about 67% industry 33% nonprofit and universities.
- The average of the individual awards has increased from approximately $850,000 to about $1,200,000. The increase in the size of the awards (or potential awards) is appropriate for the breakthrough technology.
- DOE reported that RPSEA completed both federally mandated third party audits with no material weaknesses.

There is a lack of comparison of Program process performance with other similar programs, domestic and international, with similar goals and frameworks of funding.

Recommendation #3a:

Continue internal benchmarking (i.e., within the UDW Program).

Recommendation #3b:

Assess Program process performance by evaluating/conducting external benchmarking with other R&D programs (e.g., Unconventional Resources Program, Small Producers Program, DEMO 2000).

4.0 ULTRA-DEEPWATER ADVISORY COMMITTEE – 2008-2010

Mr. Kent F. Abadie Manager Development and Production Shell Exploration & Production Company	Dr. Joe R. Fowler* President Stress Engineering Services, Inc.	Mr. Stephen Sears* Department Chair Dept. of Petroleum Engineering Louisiana State University
Mr. Paul N. Cicio President Industrial Energy Consumers of America	Dr. Luc T. Ikelle* Robert R. Berg Professor Texas A&M University	Mr. Paul T. Tranter Vice President Asset Management, Floating Rigs Transocean, Inc.
Mr. Daniel J. Daulton U.S. Technical Marketing Manager BJ Services Company	Dr. Arnis Judzis Vice President TerraTek Schlumberger	Mr. Paul M. Wiencke Director Research Council of Norway
Dr. Quenton R. Dokken Executive Director Gulf of Mexico Foundation	Mr. Daniel T. Seamount, Jr., Chair Alaska Oil & Gas Conservation Commission	Ms. Mary Jane Wilson* President and CEO WZI Inc.

*Special Government Employee

5.0 SUBCOMMITTEE TOPICS AND MEMBERS

The Plan review and preparation of the final Committee Report involved the following:

R&D Program Portfolio

Lead – Quenton Dokken

Members – Joe Fowler, Stephen Sears, Arnis Judzis, Paul Cicio, Morten Wiencke, Rick Mitchell* & Ray Charles*

**Former UDAC/Subcommittee Members*

Program Process

Lead – Mary Jane Wilson

Members – Kent Abadie, Luc Ikelle, Dan Seamount & Paul Tranter

Editing Subcommittee

Lead – Kent Abadie

Members – Dan Daulton, Arnis Judzis & Quenton Dokken