Secure Energy for America

2011 Ultra-Deepwater Draft Annual Plan

James M. Pappas
UDAC Meeting
L’Enfant Plaza Hotel
Washington, D.C.
February 23, 2011
Contents

• RPSEA Organization
• Current Project Status
• UDW Program
• 2010 Requests For Proposals
• 2011 Draft Annual Plan
• Final Thoughts
Current Program Structure/Funding

Program Funding From Federal Oil and Gas Royalties

Total Program: $50 M/yr

Fossil Energy Office

Department of Energy

Unconventional $16.25 M

Ultra-deepwater $17.5 M

Small Producer Program $3.75 M

In-House R&D Program

NETL

Designed to be 10 year, $500M directed spending.

Secure Energy for America
RPSEA Members

Member States in Yellow

Members listed by state on reverse

Updated 8/16/2010
RPSEA Organization

Strategic Advisory Committee (SAC)
Strategic direction/long-range planning advice/identifies metric areas

Board of Directors

President

Small Producer Research Advisory Group (RAG)
Recommendations on elements of draft Annual Plan, technical review, and selection of proposals

Small Producer Team Lead

Ultra-Deepwater Program Advisory Committee (PAC)
Recommendations on elements of draft Annual Plan and selection of proposals

Ultra-Deepwater Technical Advisory Committees (TAC)
Includes experts who study and apply technologies in real field situations, identify current technology gaps and define the specific R&D efforts needed

Unconventional Resources Program Advisory Committee (PAC)
Recommendations on elements of draft Annual Plan and selection of proposals

Environmental Advisory Group (EAG)
Provides input to all programs regarding environmental issues

Unconventional Resources Technical Advisory Committee (TAC)
Includes experts in a range of technical disciplines that provide technical reviews of proposals submitted to RPSEA
Building a Relevant Portfolio

Year One

- Enabling/Cross-cutting Themes
- Enhancing Themes

Year Two

- Science Themes
- Grand Challenges
- Down-selection, moving to demonstration

Years Five thru Ten

- Careful selection of key enabling and cross-cutting technologies that meet multiple objectives or enable the development of a suite of technologies
- Smaller more numerous awards towards the basic end of the research spectrum
- Development of “low-hanging fruit” or technologies that provide incremental improvements in E&P economics, etc.
Contents

• RPSEA Organization
• Current Project Status
• UDW Program
• 2010 Requests For Proposals
• 2011 Draft Annual Plan
• Final Thoughts
Summary of Proposals 2007-2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Received</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>98</td>
<td>42</td>
</tr>
<tr>
<td>2008</td>
<td>116</td>
<td>29</td>
</tr>
<tr>
<td>2009</td>
<td>99</td>
<td>28</td>
</tr>
</tbody>
</table>

Dollar Value of Proposal ($MM)

- **Cost Share**
- **RPSEA**
2007-2009 Proposals

Dollar value of Proposals ($MM)

- Received (162)
- Selected (39)
- Received (68)
- Selected (19)
- Received (83)
- Selected (41)

Unconventional Resources
Small Producer
Ultra-Deepwater

Cost Share
RPSEA
## Portfolio Overview

### RPSEA Program Selections 2007-2009

<table>
<thead>
<tr>
<th></th>
<th>Small Producer</th>
<th>Unconventional Resources</th>
<th>Ultra-Deepwater</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities</td>
<td>14</td>
<td>25</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td>For Profits</td>
<td>4</td>
<td>4</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Non-Profits</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>National Labs</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>State Agencies</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Selected</strong></td>
<td><strong>19</strong></td>
<td><strong>39</strong></td>
<td><strong>41</strong></td>
<td><strong>99</strong></td>
</tr>
</tbody>
</table>
Contents

• RPSEA Organization
• Current Project Status
• UDW Program
• 2010 Requests For Proposals
• 2011 Draft Annual Plan
• Final Thoughts
UDW Mission

Identify and develop technologies, architectures, and methods that ensure safe and environmentally responsible exploration and production of hydrocarbons from the ultra-deepwater (UDW) portion of the Outer Continental Shelf (OCS) in an economically viable (full life cycle) manner.
Ultra-Deepwater Resources. Awards from allocations under section 999H(d)(1) shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater.
RPSEA UDW Structure
PAC and TACs

Resource of >700 SMEs from industry, academia and government!

Program Advisory Committee
“PAC”

Regulatory TAC
51 Active Members

Subsea Systems TAC
138 Active Members

Drilling & Completions TAC
66 Active Members

Met Ocean TAC
55 Active Members

Flow Assurance TAC
100 Active Members

Floating Facilities TAC
150 Active Members

Reservoir Engineering TAC
44 Active Members

Systems Engineering TAC
76 Active Members

Geosciences TAC
15 Active Members
UDW Technology Development Goals

• Extend basic scientific understanding of various processes and phenomena directly impacting UDW production system design and reliable operation of a ultra-deepwater production system

• Develop “enabling” technologies

• Enhance existing technologies to help lower overall cost and risks

• Pursue new technologies which, if successfully developed, are capable of “leapfrogging” over conventional pathways
Maximize the Value of Domestic Resources:

• Increase production of ultra-deepwater oil and gas resources
• Reduce costs to find, develop, and produce such resources
• Increase efficiency of exploitation of such resources
• Increase production efficiency and ultimate recovery of such resources
• Increase safety and environmental awareness by addressing safety and environmental focus impacts associated with ultra-deepwater exploration and production, and technology development.
To meet the UDW Program goals, **6 objectives** were identified:

1. Technology Needs
2. Technology Research & Development, and Applied Science
3. Awareness and Cost-Share Development
4. Technical Development and Field Qualified
5. Environmental and Safety Technology Development and Deployment
6. Technology Demonstration
Objective 1

1. Technology Needs Assessment

     • Identified specific technology gaps that hinder UDW development
   – Proposals solicited to address identified gaps
   – These gaps have been and will continue to be periodically revisited
     • With UDW TAC input
     • With UDW PAC input
     • By RPSEA
     • With BOD direction
Objective 2

2. Technology Research & Development, and Applied Science

- The early years of the UDW formed base of the technology development triangle
- Subsequent years will fund additional technical development, demonstration, and potential commercialization of promising technologies
  - Multiple rounds of solicitations for R&D contracts designed to meet the stated goal and identified “Needs”
  - Current funding limits = project prioritization and selection likely to result in most significant increases in value
  - Funding directed to innovative and novel projects as well as graduate study proposals
Objective 3

3. Awareness and Cost-Share Development
   - Network with academia, industry, and other key stakeholders
     - Increase its awareness
     - Promote involvement
     - Identify cost-share funding for development of new technologies
Objective 4

4. Technical Development and Field Qualified Projects
   – Continue to develop and mature most promising technologies
   – Strong focus on field qualifying projects with greatest potential
     • Project results assessment
     • Additional solicitations as needed
Objective 5

5. Environmental and Safety Technology Development and Deployment
   - Assess environmental and safety impact of all projects
   - Forms
     • Individual solicitations
     • Elements of more extensive project-based solicitations
Objective 6

6. Technology Demonstration

- Work with industry, appropriate regulatory agencies, and other key stakeholders to provide seed-level funding and other incentives
  - New technologies demonstration
  - New technologies validation
UDW Program Approach

The Challenges

Walker Ridge/Keathley Canyon
- subsalt
- deeper wells
- tight formations

Alaminos Canyon
- viscous crude
- lacking infrastructure

Eastern Gulf – Gas
Independence Hub
- higher pressure & temperature
  - CO₂/H₂S

Overall
- higher drilling costs
- challenging economics
Secure Energy for America

UDW Program Flowchart

UDW Projects

- Well Construction Cost Reduction
- Completion Cost Reduction
- Intervention (down-hole) Services
- Reservoir Characterization and Appraisal
- Improve Recovery
- Subsea Processing and Boosting
- Power Generation, Transmission and Distribution
- Stabilization Flow
- Intervention (in-water)
- Dry Trees/Direct Well Intervention
- Risers
- Innovative/Novel Concepts
- Emerging Tech/Grad Students
- Health, Safety and Environment Concerns with Emerging Facilities

Program Needs

1. Drilling, Completion and Intervention Breakthroughs
2. Appraisal and Development Geoscience and Reservoir Engineering
3. Significantly Extend Satellite Well Tie-Back/Host Elimination
4. Dry Trees and Risers in 10,000 foot water depth
5. Continuous Improvement and Innovation
6. Health, Safety and Environment Concerns

Program Goal

UDW Resources to Reserves with New Technologies
## 2007 UDW Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Project Title</th>
<th>Contracted; lead</th>
<th>Award (RPSEA portion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1201</td>
<td>Wax Control</td>
<td>University of Utah</td>
<td>$400,000</td>
</tr>
<tr>
<td>1301</td>
<td>Improvements to Deepwater subsea measurements</td>
<td>Letton Hall Group</td>
<td>$3,600,126</td>
</tr>
<tr>
<td>1302</td>
<td>High Conductivity Umbilicals</td>
<td>Technip</td>
<td>$448,000</td>
</tr>
<tr>
<td>1401</td>
<td>Composite Riser for UDW High Pressure Wells</td>
<td>Lincoln Composites</td>
<td>$1,678,411</td>
</tr>
<tr>
<td>1402</td>
<td>Deepwater dry tree system for drilling production</td>
<td>FloTec / Houston Offshore</td>
<td>$1,090,728</td>
</tr>
<tr>
<td>1403</td>
<td>Fatigue Performance of High Strength Riser Materials</td>
<td>SwRI</td>
<td>$800,000</td>
</tr>
<tr>
<td>1501</td>
<td>Extreme Reach Development</td>
<td>Tejas <em>(unable to contract - $200,000)</em></td>
<td></td>
</tr>
<tr>
<td>1603a</td>
<td>Hydrate Plugging Risk</td>
<td>Tulsa Univ.</td>
<td>$120,000</td>
</tr>
<tr>
<td>1603b</td>
<td>Hydrate Characterization &amp; Dissociation Strategies</td>
<td>Tulsa Univ.</td>
<td>$120,000</td>
</tr>
<tr>
<td>1603c</td>
<td>Design investigation xHPHT, SSSV</td>
<td>Rice Univ.</td>
<td>$120,000</td>
</tr>
<tr>
<td>1603d</td>
<td>Robotic MFL Sensor; monitoring &amp; inspecting risers</td>
<td>Rice Univ.</td>
<td>$120,000</td>
</tr>
<tr>
<td>1701</td>
<td>Improved Recovery</td>
<td>Knowledge Reservoir</td>
<td>$1,599,722</td>
</tr>
<tr>
<td>1801</td>
<td>Effect of Global Warming on Hurricane Activity</td>
<td>NCAR</td>
<td>$544,085</td>
</tr>
<tr>
<td>1901</td>
<td>Subsea processing System Integration</td>
<td>GE Research</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>1902</td>
<td>Deep Sea Hybrid Power Systems:</td>
<td>HARC</td>
<td>$480,000</td>
</tr>
<tr>
<td>2001</td>
<td>Geophysical Modeling Methods</td>
<td>SEG</td>
<td>$2,633,364</td>
</tr>
</tbody>
</table>

**15 awarded** $15,104,426
## 2008 UDW Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Project Title</th>
<th>Selected: lead</th>
<th>Award (RPSEA portion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2101-02</td>
<td>New Safety Barrier Testing Methods</td>
<td>Southwest Research Institute</td>
<td>$128,000</td>
</tr>
<tr>
<td>1202</td>
<td>EOS improvement for xHPHT</td>
<td>NETL ($1,600,000)</td>
<td></td>
</tr>
<tr>
<td>2201-02</td>
<td>Heavy Viscous Oils PVT for Ultra-Deepwater</td>
<td>Schlumberger Limited</td>
<td>$458,455</td>
</tr>
<tr>
<td>2301-03</td>
<td>Riserless Intervention System (RIS)</td>
<td>DTC International</td>
<td>$3,382,017</td>
</tr>
<tr>
<td>1502-01</td>
<td>Coil Tubing, Drilling and Intervention Systems Using Cost Effective Vessel</td>
<td>Nautilus International, LLC</td>
<td>$820,000</td>
</tr>
<tr>
<td>2501-02</td>
<td>Early Reservoir Appraisal, Utilizing a Well Testing System</td>
<td>Nautilus International, LLC</td>
<td>$820,000</td>
</tr>
<tr>
<td>2502-01</td>
<td>MPD; Advanced Steady-State and Transient, Three-Dimensional, Single and Multiphase, Non-Newtonian Simulation System for Managed Pressure Drilling</td>
<td>Stratamagnetic Software, LLC</td>
<td>$360,000</td>
</tr>
<tr>
<td>2701-03</td>
<td>Resources to Reserves Development and Acceleration through Appraisal</td>
<td>The University of Texas at Austin</td>
<td>$197,824</td>
</tr>
<tr>
<td>2801-02</td>
<td>Gulf 3-D Operational Current Model Pilot</td>
<td>Portland State University</td>
<td>$1,248,000</td>
</tr>
<tr>
<td>2901-01</td>
<td>Ultra-Reliable Deepwater Electrical Power Distribution System and Power Components</td>
<td>GE Global Research</td>
<td>$4,999,994</td>
</tr>
<tr>
<td>2902-02</td>
<td>Technologies of the Future for Pipeline Monitoring and Inspection</td>
<td>University of Tulsa</td>
<td>$120,000</td>
</tr>
<tr>
<td>2902-03</td>
<td>Wireless Subsea Communications Systems</td>
<td>GE Global Research</td>
<td>$120,000</td>
</tr>
<tr>
<td>2902-04</td>
<td>Replacing Chemical Biocides with Targeted Bacteriophages in Deepwater Pipelines and Reservoirs</td>
<td>Phage Biocontrol, LLC</td>
<td>$120,000</td>
</tr>
<tr>
<td>2902-06</td>
<td>Enumerating Bacteria in Deepwater Pipelines in Real-Time at a Negligible Marginal Cost Per Analysis: A Proof of Concept Study</td>
<td>Livermore Instruments, Inc.</td>
<td>$119,730</td>
</tr>
<tr>
<td>2902-07</td>
<td>Fiber Containing Sweep Fluids for Ultra-Deepwater Drilling Applications</td>
<td>University of Oklahoma</td>
<td>$119,972</td>
</tr>
<tr>
<td><strong>15 Projects</strong></td>
<td><strong>14 Awarded</strong></td>
<td><strong>$13,013,992</strong></td>
<td></td>
</tr>
</tbody>
</table>
## 2009 UDW Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Project Title</th>
<th>Selected; lead</th>
<th>Approx. RPSEA share</th>
</tr>
</thead>
<tbody>
<tr>
<td>3100-01</td>
<td>Ultra Deepwater Seabed Discharge of Produced Water and/or Salts</td>
<td>Fluor</td>
<td>$ 448,956</td>
</tr>
<tr>
<td>3300-02</td>
<td>Displacement and Mixing in Subsea Jumpers: Experimental Data and CFD Simulations</td>
<td>Univ of Tulsa</td>
<td>$ 254,952</td>
</tr>
<tr>
<td>3300-05</td>
<td>Autonomous Inspection of Subsea Facilities</td>
<td>Lockheed Martin</td>
<td>$ 994,020</td>
</tr>
<tr>
<td>3300-06</td>
<td>High Resolution 3D Laser Imaging for Inspection, Maintenance, Repair, and Operations</td>
<td>3D at Depth, LLC</td>
<td>$ 498,898</td>
</tr>
<tr>
<td>3300-08</td>
<td>Sensors and Processing for Pipe, Riser, Structure, and Equipment Inspection to Provide Detailed Measurements, Corrosion Detection, Leak Detection, and/or Detection of Heat Plumes from Degraded Pipeline Insulation</td>
<td>Blueview Technologies</td>
<td>$ 468,463</td>
</tr>
<tr>
<td>3300-10</td>
<td>Development of Carbon Nanotube Composite Cables for Ultra Deepwater Oil and Gas Fields</td>
<td>Los Alamos National Laboratory</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>3500-01</td>
<td>Intelligent Production System for Ultra Deepwater with Short Hop Wireless Power and Wireless Data Transfer for Lateral Production Control and Optimization</td>
<td>Tubel LLC</td>
<td>$1,103,000</td>
</tr>
<tr>
<td>3500-02</td>
<td>Fatigue Testing of Shrink-fit Riser Connection for High Pressure Ultra Deepwater Risers</td>
<td>Subsea Riser Products</td>
<td>$ 349,806</td>
</tr>
<tr>
<td>3500-07</td>
<td>Deepwater Subsea Test Tree and Intervention Riser System</td>
<td>DTC International, Inc.</td>
<td>$1,551,239</td>
</tr>
<tr>
<td>3500-10</td>
<td>Gyroscope Guidance Sensor for Ultra Deepwater Applications</td>
<td>Laserlith Corporation</td>
<td>$ 489,346</td>
</tr>
<tr>
<td>3700-02</td>
<td>A 1,000-Level Drill Pipe Deployed Fiber Optic 3C Receiver Array for Deep Boreholes</td>
<td>Paulsson, Inc</td>
<td>$1,994,329</td>
</tr>
<tr>
<td><strong>11 Projects</strong></td>
<td><strong>11 Projects</strong></td>
<td><strong>11 Projects</strong></td>
<td><strong>$10,153,009</strong></td>
</tr>
</tbody>
</table>
Contents

• RPSEA Organization
• Current Project Status
• UDW Program

• 2010 Requests For Proposals
• 2011 Draft Annual Plan
• Final Thoughts
2010 UDW Plan Strategy

- 6 Initiative-based RFPs (6 to 10 project awards)
- UDW TACs have voted for individual projects.
- This input was evaluated by the PAC to decide appropriate balance for 2010 UDW program.
- UDW 2010 RFPs to consist of both specific projects and broader initiative-based requests.
## 2010 UDW Funding by Need

<table>
<thead>
<tr>
<th>Need #1</th>
<th>Drilling Completion and Intervention Breakthroughs</th>
<th>TAC Recommended Topics</th>
<th>Total Project Cost</th>
<th>Phase 1 Cost (First Year)</th>
<th>Phase 2+ Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$</td>
</tr>
</tbody>
</table>

| Need #2 | Appraisal & development geoscience and reservoir engineering |                        | $1,500,000         | $1,500,000                |               |

| Need #3 | Significantly extend subsea tieback distances / surface host elimination |                        | $4,217,000         | $1,967,000                | $2,250,000    |

| Need #4 | Dry trees / Direct well intervention and risers in 10,000' wd. |                        | $3,890,000         | $3,890,000                | $             |

| Need #5 | Continuous Improvement / Optimize field development |                        | $               | $                   |               |

| Need #6 | Associated Safety and Environmental Concerns |                        | $33,203,000      | $17,928,000              | $15,275,000   |

| Total   |                                                   |                        | $44,810,000       | $27,285,000              | $17,525,000   |

| 1st Year (FY2010) | Future Year |
## 2010 UDW Funding by Sub-Need

<table>
<thead>
<tr>
<th>Title / Description</th>
<th>Total Project Cost</th>
<th>Phase 1 Cost (First Year)</th>
<th>Phase 2+ Cost</th>
<th>Schedule (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Need #1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Completions</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention (Downhole Services)</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Intervention (In-Water IMR)</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended Well Testing</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Need #2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appraisal &amp; development geoscience and reservoir engineering</td>
<td>$1,500,000</td>
<td>$1,500,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir Surveillance</td>
<td>Reservoir IOR</td>
<td>1,500,000</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Need #3</strong></td>
<td>$4,217,000</td>
<td>$1,967,000</td>
<td>$2,250,000</td>
<td></td>
</tr>
<tr>
<td>Stabilized Flow</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subsea Power</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsea Electrical Penetrators</td>
<td>$335,000</td>
<td>$85,000</td>
<td>$250,000</td>
<td>18</td>
</tr>
<tr>
<td>Phase 1 - Connectors Technology Workshop to identify needs, gaps and strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 2 - Connector Qualification Testing and Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subsea Power</strong></td>
<td>$3,000,000</td>
<td>$1,000,000</td>
<td>$2,000,000</td>
<td>36</td>
</tr>
<tr>
<td>Ultra-High Conductivity Umbilicals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subsea Power</strong></td>
<td>$882,000</td>
<td>$882,000</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Subsea Power Modeling Tool Verification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subsea Power</strong></td>
<td>$250,000</td>
<td>$250,000</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Subsea Processing, Pressure Boosting, Instrumentation and Controls</td>
<td>All Electric Subsea Autonomous HPSS Architecture</td>
<td>$250,000</td>
<td>$250,000</td>
<td>12</td>
</tr>
<tr>
<td><strong>Need #4</strong></td>
<td>$3,890,000</td>
<td>$3,890,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry trees / Direct well intervention and risers in 10,000’ wd.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riser Systems</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dry Tree Structures</strong></td>
<td>$1,280,000</td>
<td>$1,280,000</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Ultra-deepwater Dry Tree System for Drilling and Production in GOM, Phase 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dry Tree Structures</strong></td>
<td>$1,750,000</td>
<td>$1,750,000</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Affect of Fiber Rope seabed contact on subsequent Rope Integrity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dry Tree Structures</strong></td>
<td>$860,000</td>
<td>$860,000</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Direct Offloading System - Phase 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Need #5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Improvement / Optimize field development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Term Research and Development and Graduate Student Program</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensors, tools and Inspection Processes</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bridging and Contingency</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Secure Energy for America
## 2010 UDW Funding by Sub-Need

<table>
<thead>
<tr>
<th>Topic</th>
<th>TAC Recommended Topics</th>
<th>Total Project Cost</th>
<th>Phase 1 Cost (First Year)</th>
<th>Phase 2+ Cost</th>
<th>Schedule (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Need #6</strong></td>
<td>Associated Safety and Environmental Concerns</td>
<td>$33,203,000</td>
<td>$17,928,000</td>
<td>$15,275,000</td>
<td></td>
</tr>
<tr>
<td>Environmental Issues: Marine</td>
<td>Hurricane Impact on Infrastructure &amp; Environment</td>
<td>1,000,000</td>
<td>1,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Issues: Marine</td>
<td>Climate Change Impact on Future Hurricanes (1801 Phase 2)</td>
<td>350,000</td>
<td>350,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Issues: Drilling</td>
<td>Wellbore Integrity Improvement &amp; Strengthening Methods</td>
<td>3,750,000</td>
<td>750,000</td>
<td>3,000,000</td>
<td>36</td>
</tr>
<tr>
<td>Environmental Issues: Drilling</td>
<td>Deepwater Reverse Circulation Primary Cementing &amp; Wellbore Integrity</td>
<td>1,080,000</td>
<td>1,080,000</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Environmental Issues: Drilling</td>
<td>Ahead of the Bit &amp; pre-drill Blazzard Identification; Tar Detection</td>
<td>3,500,000</td>
<td>500,000</td>
<td>3,000,000</td>
<td>36</td>
</tr>
<tr>
<td>Safety Issues: Production/Completion</td>
<td>Intelligent Casing to minimize intervention</td>
<td>500,000</td>
<td>500,000</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Environmental Issues: Facilities</td>
<td>Early Production System (EPS) FEED and critical component prototype design</td>
<td>2,000,000</td>
<td>2,000,000</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Safety Issues: Reservoir/Production</td>
<td>Equation of State Development for Extreme High Pressure and High Temperature</td>
<td>900,000</td>
<td>300,000</td>
<td>600,000</td>
<td>36</td>
</tr>
<tr>
<td>Safety Issues: Production/Facilities</td>
<td>Hydrates in Gas Dominated Systems</td>
<td>850,000</td>
<td>450,000</td>
<td>400,000</td>
<td>24</td>
</tr>
</tbody>
</table>

### Total 1st Year (FY2010) $42,810,000
### Total Future Year $17,525,000

---

Secure Energy for America
Contents

- RPSEA Organization
- Current Project Status
- UDW Program
- 2010 Requests For Proposals
- 2011 Draft Annual Plan
- Final Thoughts
Deepwater Horizon's 11 Dead Remembered
Deepwater Horizon Incident Results

• Industry must re-evaluate risk management approach

• Components
  – Conduct research necessary to ensure UDW risks are fully understood
  – Conduct research to ensure means are available to fully mitigate those risks

• Focus
  – Spill prevention
  – Spill recovery
  – Risk assessment, mitigation, elimination
2011 Solicitations

• What has not changed
  – Technical and architecture needs still exist
  – Prioritize technology needs
  – Continue to develop and mature selected projects
  – Accelerate resources to reserves

• What has changed
  – Added emphasis on environmental and safety issues
  – Needs identified as result of analysis of the Deepwater Horizon incident
2011 Solicitations: Accelerating Reserves

- Strategically begin combining previously developed technologies
  - Establish cohesive and comprehensive systems
  - Systems to address overall needs
  - To lead toward field demonstrations and ultimately to commercialization
- UDW program
  - Fewer and larger projects
  - Emphasize cross-cutting projects
2011 Solicitations: Environmental and Safety Emphasis

• To include:
  – Analyses of systems integrity in UDW environments
  – Environmental studies regarding the potential impact of UDW operations
  – Specific technology developments aimed at increasing the safety of offshore operations
2011 Solicitations: Environmental and Safety Specifics

• Embedded in DAP and cross-cutting all Program elements is a focus on the environment:
  – Minimize or mitigate environmental impact or risk
  – Mitigate water usage
  – Reduce “footprint”
  – Lower emissions
Environmental and Safety Common Elements

• Common element focal points:
  – Understand risks associated with oil and gas development operations
  – Develop technologies to mitigate those risks
  – All projects in the Program evaluated:
    • For potential and ongoing environmental impacts as applicable
    • To ensure that impacts are fully understood during project selection and management
2011 Solicitations: General Themes

• Emergency prevention, preparedness, response and recovery

• Next phase projects based on completed projects from the 2007 and 2008 program

• Specific project ideas to fill in identified technical gaps

• Graduate Student and Innovative/Novel projects
NEW ...

7. Emergency Prevention, Preparedness, Response and Recovery

– Work with appropriate regulatory agencies, industry, and other key stakeholders

• Identify technology needs arising from the Deepwater Horizon incident

• July RPSEA Forum: “Research & Technology Needs for Deepwater Development: Addressing Oil Recovery & Effective Cleanup of Oil Spills”
2011 Solicitations: Objectives

To meet the 2011 UDW Program goals, there are now 7 objectives:

1. Technology Needs
2. Technology Research & Development, and Applied Science
3. Awareness and Cost-Share Development
4. Technical Development and Field Qualified
5. Environmental and Safety Technology Development and Deployment
6. Technology Demonstration
7. Emergency Prevention, Preparedness, Response and Recovery
2011 Solicitation Needs

Subject to guidance from UDW PAC, funding timing, BOD direction, and other relevant factors such as results from the President’s commission on the Deepwater Horizon incident.

1. Drilling, Completion, and Intervention Breakthroughs
2. Appraisal and Development Geoscience and Reservoir Engineering
3. Significantly Extend Subsea Tieback Distances/Surface Host Elimination
4. Dry Trees/Direct Well Intervention and Risers in 10,000’ Water Depth
5. Continuous Improvement and Innovation
6. Associated Safety and Environmental Concerns
2011 Solicitation Need 1

1. **Drilling, Completion, and Intervention Breakthroughs**
   - Proposals to identify novel ideas to reduce well construction and completion costs
   - Funding follow-on recommendations from 2007 and 2008 projects
2011 Solicitation Need 2

2. **Appraisal and Development Geoscience and Reservoir Engineering**
   - Proposals in the area of formation and reservoir characterization and/or surveillance
   - Goal - Improve recovery and thus reduce the amount of unproduced hydrocarbons upon well or field abandonment
3. **Significantly Extend Subsea Tieback Distances/Surface Host Elimination**

- Proposals addressing follow-on recommendations from 2007 and 2008 projects.
- New proposals may be requested in one or more of the following areas:
  - UDW flow assurance, especially for the areas of solids (asphaltenes, hydrates, waxes, and scale) deposition and plug formation management
  - Pressure boosting
  - Autonomous underwater vehicles and intervention
  - Subsea processing/produced water treatment
2011 Solicitation Need 4

4. **Dry Trees/Direct Well Intervention and Risers in 10,000’ Water Depth**
   
   – Need area was addressed in 2007 and 2008 UDW program
   
   – Next Phase proposals may be requested addressing recommendations from 2007 and 2008 projects
5. **Continuous Improvement and Innovation**

   - Proposals may include:
     
     - Novel safety or environmental improvement techniques or processes
     - Advancing industry understanding of phenomena and science impacting UDW operations
     - Improvements in integrity management and reliability
     - Additional graduate student and project funding
     - Innovative technology high risk, high reward “long-shot opportunities
6. **Associated Safety and Environmental Concerns**
- Work with appropriate regulatory agencies, industry, and other key stakeholders to identify emergency prevention, preparedness, response, and recovery technology needs suitable for UDW operations
- May include findings arising from Deepwater Horizon incident
- Focus:
  - Spill prevention
  - Spill mitigation
  - Ecosystems identification and valuation
2011 Proposed RPSEA UDW Structure:

PAC and TACs

Program Advisory Committee “PAC”

- Environmental, Safety, & Regulatory TAC
  - 50+ Active Members

- Subsea Systems TAC
  - 138 Active Members

- Drilling & Completions TAC
  - 66 Active Members

- Met Ocean TAC
  - 55 Active Members

- Flow Assurance TAC
  - 100 Active Members

- Floating Facilities TAC
  - 150 Active Members

- Reservoir Engineering TAC
  - 44 Active Members

- Systems Engineering TAC
  - 76 Active Members

- Geosciences TAC
  - 15 Active Members
Anticipated Awards

- Carry-over = $21 million available
- Project count = 4 multi-project awards & 4 continuation projects
  - $1 – 5 million each
- Project duration = 1 – 3 years
- Stage-gate approach to funding
  - Decision points for additional funding
  - Program close-out date of fiscal year 2014
Ongoing Activities

• Administration of current contracts
• Solicitation of new proposals
• Planning for the following year(s)
• Specifics:
  – Develop and release RFPs
  – Select, negotiate, and award subcontracts
  – Perform project management functions for current contracts and for future award
    • Emphasis on combination of increased number and size of ongoing R&D efforts and their fit, in terms of both timing and funding, with planned future efforts and direction
Technology Transfer Approaches

- Engagement of PAC and TAC Members
  - Project selection and review
  - Participation in field tests as “early adopters”
  - Quarterly TAC meetings are an important aspect of ongoing tech transfer
  - Working Committee (cost share partners)
- Active Coordination with NETL on Knowledge Management Database (KMD)
- RPSEA Website Enhancement
  - Project information
  - Program direction
- 2.5% set-aside for each subcontract
  - 1.5% Project Level
  - 1% Program Level
Project-Level Technology Transfer

- Funded by 1.5% Set-aside
- Managed by subcontractors (with RPSEA final approval)
  - Project-specific websites
  - Participation in conferences, workshops
  - Preparation of articles for journals, trade publications
Program-Level Technology Transfer

- Funded by 1% Set-aside
- Managed by RPSEA
  - Website Enhancements
  - Coordination with NETL KMD,
  - Events at Major Technical Conferences (SPE, OTC, SEG, etc.)
    - Poster sessions
    - PI / PM booth presentations & discussions
Contents

- RPSEA Organization
- Current Project Status
- UDW Program
- 2010 Requests For Proposals
- 2011 Draft Annual Plan
- Final Thoughts
Final Thoughts

• Our world has changed

• Effects on UDW

• Opportunity is knocking

• RPSEA and UDW Program, coordinated with NETL, will respond