



# FY 2007 & 2008 Ultra Deepwater Program

6 November 2008

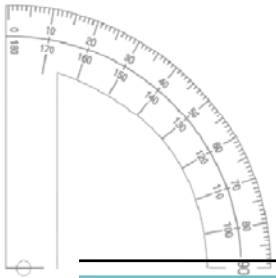
Houston, Texas

Art Schroeder;

Manager, Deepwater Technology and Commercialization

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Secure Energy for America



# Significant Demand for UDW Technology Funding

April, 2007

120+ Project Ideas  
\$300 MM

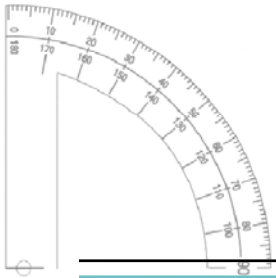
June, 2007

70 Project Ideas  
\$175 MM

July, 2007

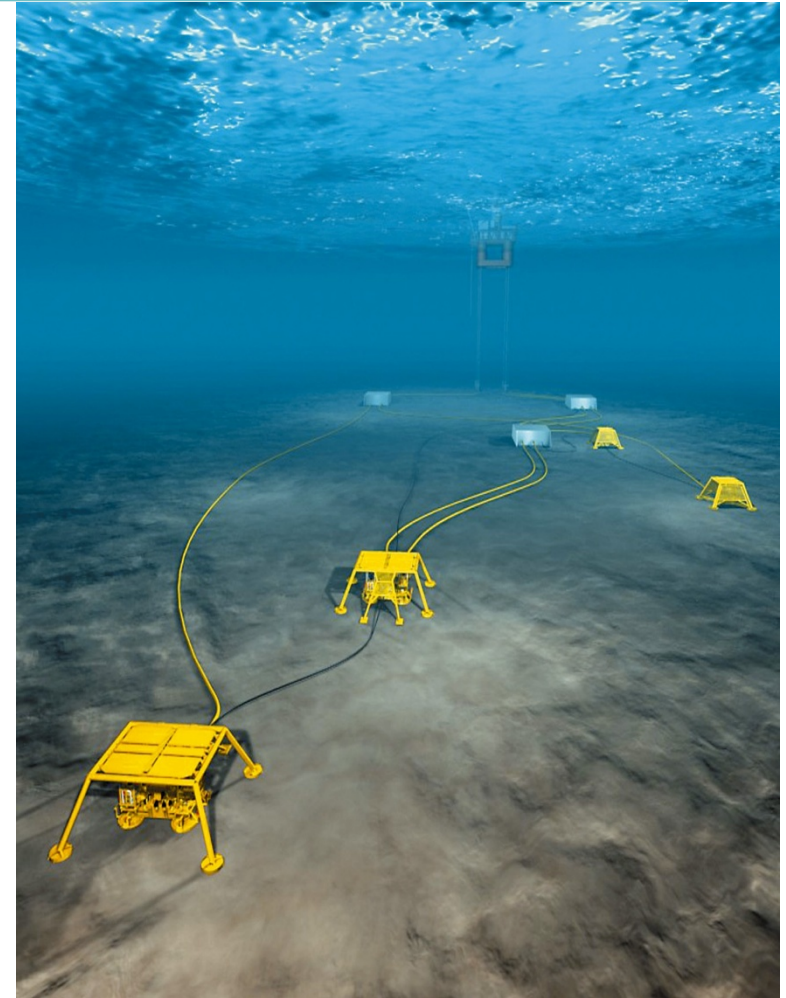
26 Project Ideas  
\$30 MM

***RPSEA 2007 & 2008 Projects***



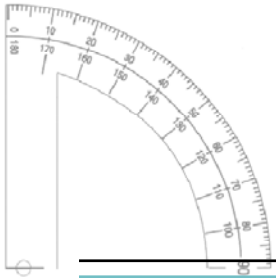
# RPSEA UDW 2007 Time table

- 4 RFPs released 10-29-07
  - 9 proposals 12-27-07
- 5 RFPs released 11-28-07
  - 13 proposals 1-28-08
- 5 RFPs released 2-11-08;
  - 10 proposals 4-14-08
- 1<sup>st</sup> UDW Selection 2-5-08
- 1<sup>st</sup> UDW Selection submitted to NETL 3-13-08
- 1<sup>st</sup> UDW Selection approved by NETL 3-20-08



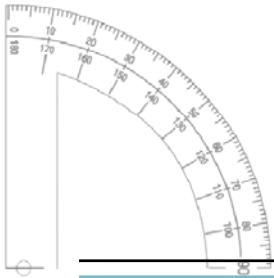
# Ultra-Deep Water Project Selections





# RPSEA 2007 Selected Proposals

Categories	UDW	Unconventional	Small Producers	Total
Universities	5	13	6	24
National Laboratories	-	2	1	3
Nonprofit Corporation	4	1	-	5
For Profit Corporation	8	1	-	9
Geological Science	-	2	-	2
	17	19	7	<b>43</b>



# RPSEA FY2007 UDW Projects

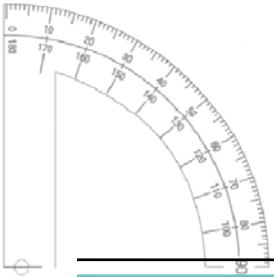
Project	Project Title	Number of bids	Selected / Awarded	Award (RPSEA max)
DW1201	Wax Control	3	University of Utah	\$400,000
DW1301	Improvements to Deepwater subsea measurements	2	Letton Hall Group	\$3,564,000
DW1302	Umbilicals	2	Technip	\$448,000
DW1401	Composite Riser for UDW High Pressure Wells	3	Lincoln Composites	\$1,680,000
DW1402	Deepwater dry tree system for drilling production	4	FloTec / Houston Offshore	\$936,000
DW1403	Fatigue Performance of High Strength Riser Materials	2	SwRI	\$800,000
DW1501	Extreme Reach Development	2	Tejas	\$200,000
DW1603	Design investigation xHPHT, SSSV	6	Rice Univ.	\$120,000
DW1603	Robotic MFL Sensor; monitoring & inspecting risers		Rice Univ.	\$120,000
DW1603	Hydrate Plugging Risk		Tulsa Univ.	\$120,000
DW1603	Hydrate Characterization & Dissociation Strategies		Tulsa Univ.	\$120,000
DW1701	Improved Recovery	2	Knowledge Reservoir	\$1,600,000
DW1801	Effect of Global Warming on Hurricane Activity	1	NCAR	\$560,000
DW1901	Subsea processing System Integration	2	GE Research	\$1,200,000
DW1902	Deep Sea Hybrid Power Systems:	1	HARC	\$480,000
DW2001	Geophysical Modeling Methods	2	SEG	\$2,000,000

summary

32

\$14,348,000





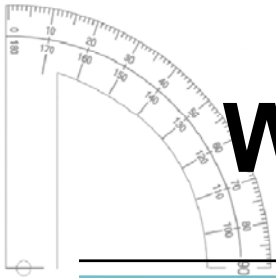
# RPSEA FY 2008 Program

Project No.	Title:	Project Cost	RPSEA
DW 1202	EOS improvement for xHPHT	\$2,000,000	\$1,600,000
DW 2101	New Safety Barrier Testing Methods	\$ 160,000	\$ 128,000
DW 2201	Viscous Oil PVT	\$575,000	\$460,000
DW 2301	Deepwater Riserless Light Well Intervention	\$6,823,000	\$3,411,500
DW 1502	Coiled Tubing Drilling and Intervention System Using Cost Effective Vessels	1,025,000	820,000
DW 2501	Early Reservoir Appraisal, Utilizing a Low Cost Well Testing System - Phase 1	\$1,100,000	\$880,000
DW 2502	Modeling and Simulation of Managed Pressure Drilling for Improved Design, Risk Assessment, Training and Operations	\$480,000	\$360,000
DW 2701	Resources to Reserves Development and Acceleration through Appraisal	\$500,000	\$400,000
DW 2801	Gulf 3-D Operational Current Model Pilot	\$1,560,000	\$1,248,000
DW 2901	Reliable deepwater power distribution & components (Component Qualification - performed in steps.)	\$6,220,000	\$4,811,000



# 2008 RFP Release Plan

- √ Modification of scope of work to reflect significant learnings from 2007 process – September 2008.
  
- √ Final review by Project Champions – October 2008.
  
- Final NETL review in November.
- Release of 2 RFP tranches with 60 day open for response
  - Early December 2008
  - Mid January 2009



# What Questions Can I Answer?



**Art Schroeder;**  
**Manager, Deepwater Technology and Commercialization**

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## RPSEA DW 1201- Wax Control

**Description:** Develop wax management technologies for use in cold slurry flow scenarios.

**Application:** Deepwater flowline tie-backs over long distances



**Objectives:** Evaluate and improve wax management technologies to:

- Minimize wall wax deposition rates.
- Improve techniques to effectively remove deposition
- Improve cold slurry flow technologies as they apply to hydrates and waxes

**Value / Impact:**

Will enable long distance tie-backs with bare steel flowlines with improved operational performance. Will not need expensive insulation or external heating.

### Results / Accomplishment

Expect resulting technologies to deliver a true comprehensive cold flow strategy without pipe insulation.

Champion: G. Shoup (BP)

Budget: \$500,000

Contractor: University of Utah

RPSEA: \$ 400,000

# RPSEA DW 1301- Improvements to Deepwater Subsea Measurement

**Description:** Perform six related tasks to improve subsea sensors and multiphase meter measurements

**Application:** Multiphase measurements are required for reservoir management and for fiscal allocation among various stakeholders.



Scale in Meter Sensor Port

**Objectives:** Improve reliable performance through:

- Deepwater Sampling
- ROV-Assisted Metering (Check meter service)
- HP/HT Sensor Qualification
- Meter Alteration Effects
- Metering System Uncertainty
- Evaluation of Flow Modeling

**Value / Impact:** Improved monitoring enables greater reservoir recovery.

**Results / Accomplishment:** A set of standards and designs will be produced and qualified to improve overall meter and sensor service.

Champion: Robert Webb (BP)

Budget: \$4,455,000

Contractor: Letton Hall Group

RPSEA: \$ 3,564,000

# RPSEA DW 1302- Ultra-High Conductivity Umbilicals

**Description:** Develop concepts and a plan-forward for deepwater power umbilicals

**Application:** Required to deliver large amounts of power subsea for major deepwater field developments.



**Objectives:** Conceptualize power umbilical technologies to increase power capacity and decrease size and weight of umbilicals. Technologies may include nano-tubes and other promising alternatives.

**Value / Impact:** Efficient delivery of subsea power is required for major deepwater developments.

**Results / Accomplishment:** Various technologies will be evaluated and a plan forward established to develop these efficient power umbilicals

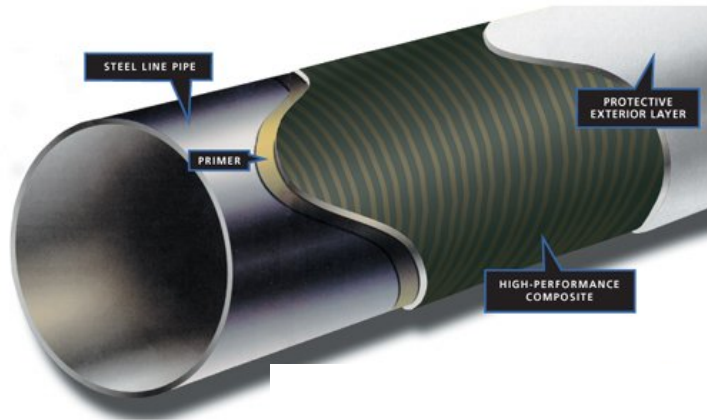
Champion: Peter Worman (CVX)  
Budget: \$560,000

Contractor: Nano Ridge  
RPSEA: \$ 448,000

# RPSEA DW 1401- Composite Riser for Ultra-Deepwater High Pressure Wells

**Description:** Develop and qualify fiber reinforced XHP riser tubulars. Build prototypes for field trials in the GOM.

**Application:** Light weight tubulars for use in drilling and production service.



**Objectives:** Determine, through large scale tests, if carbon fiber wrapped steel riser pipe (steel /composite hybrid) is suitable for long-term use in the harsh environment of deep water offshore

**Value / Impact:** Composite Risers expected to:

- Water depth capability in excess of 10,000 feet
- Operating pressure rating beyond 15,000 psia
- Provide a 50% reduction in the in-water weight of a comparable steel riser

**Results / Accomplishment:** Qualify design, fabrication and testing methodologies. Deliver some prototypes for field service in next phase.

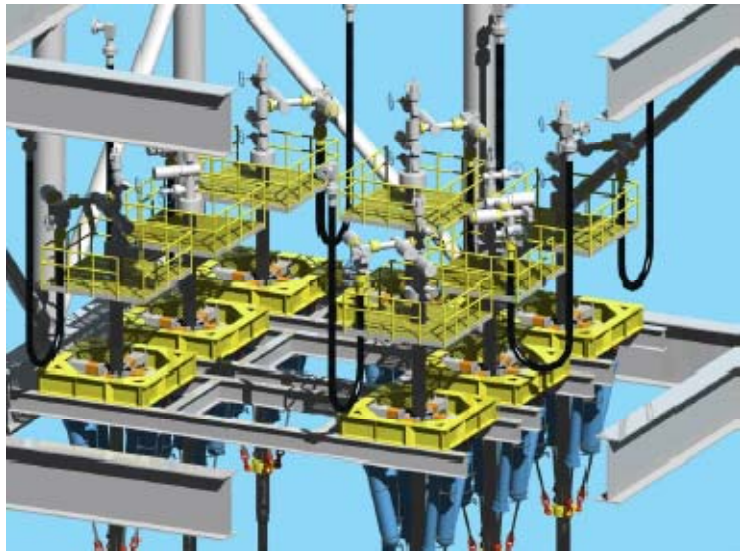
Champion: Roy Shilling (BP) & Tom Walsh (Shell)  
Budget: \$2,100,000

Contractor: Lincoln Composites  
RPSEA: \$ 1,680,000

# RPSEA DW 1402- Ultra-deepwater Dry Tree System for Drilling and Production in GOM, Phase 1

**Description:** Conceptually design and evaluate 2 hulls and 2 payloads for dry-tree ultra-deepwater structures.

**Application:** Ultra-deepwater field developments with lower costs



Dry Tree Riser Tensioner System

**Objectives:** Define the potential and gaps for developing a dry tree semi or similar hull to a feasible and competitive floater solution for GOM in 8,000 ft water depth with moderate to large payloads

**Value / Impact:** The market is currently limited to a single concept. A competitive alternative will spur improvement and cost reduction in current dry tree hosts for ultra deep water.

**Results / Accomplishment:** Designs, trade-offs, cost estimates, model tests, workshops and Phase 1 project documentation will be produced.

Champion: Paul Devlin (CVX); Shell & Statoil

Budget: \$1,170,000

Contractor: FloTech/ Houston Offshore

RPSEA: \$ 936,000

# RPSEA DW 1403- Fatigue Performance of High Strength Riser Materials

**Description:** Measure fatigue and crack growth properties for high strength steels and newer materials to qualify them for deepwater riser service.

**Application:** Ultra-deepwater Riser service optimized for weight and strength

**Objectives:** Address fracture toughness, crack growth and S-N curve tests on strip specimens of riser materials. Stress corrosion cracking (SCC) and HEE would also be conducted for simulated service conditions.

**Value / Impact:** Prequalification of high strength materials for risers will enable deepwater riser development and reduce the risk for use of such materials.

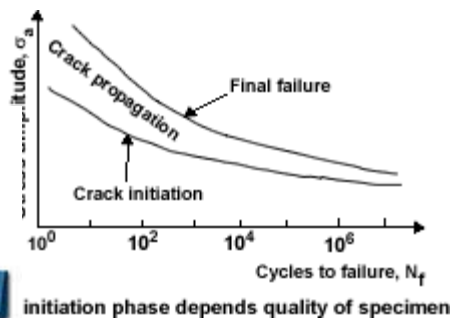
**Results / Accomplishment:** Design information detailing fatigue crack growth rates and SN curves for the materials tested.

Champion: Himanshu Gupta and Steven Shademan (BP)

Budget: \$1,000,000

Contractor: SwRI

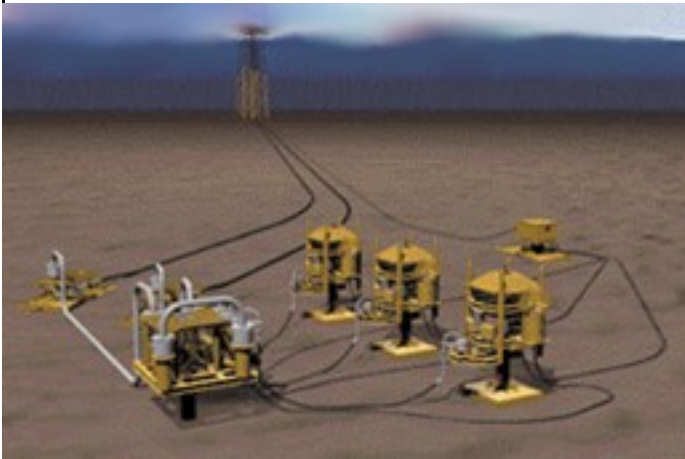
RPSEA: \$ 800,000



# RPSEA DW 1501- Extreme Reach Development

**Description:** Conceptualize new integrated drilling, completion and production technologies which are capable up to a 20 mile offset reservoir development.

**Application:** Any location where vertical surface reservoir access may be limited.



Typical Subsea Satellite Field

**Objectives:** Start with “clean” paper, establish a design basis and then conceptualize and document the required facilities and all operating procedures for reservoir development scenarios having offsets up to 20 miles

**Value / Impact:** Grand Challenge programs focus innovative (out-of-the-box) thinking having potential to enable some field developments or to reduce the cost of existing methods.

**Results / Accomplishment:** A conceptual design defining new (breakthrough) technologies offering alternative methods for satellite marginal field developments.

Champion: Phil V. Clark (CVX)

Budget: \$ 250,000

Contractor: Tejas

RPSEA: \$ 200,000

# RPSEA; Graduate Student Design Projects

DW 1603 – Design investigation xHPHT, SSSV; Rice University

DW 1603 b– Robotic MFL Sensor; monitoring & inspecting risers;  
Rice University

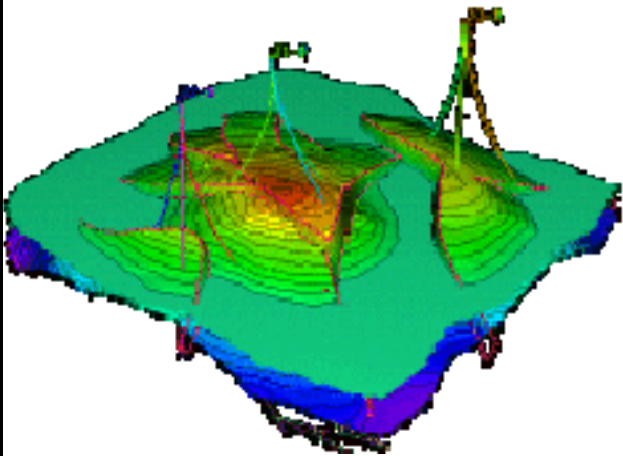
DW 1603 c – Hydrate Plugging Risk; Tulsa University

DW 1603 d –Hydrate Characterization & Dissociation Strategies;  
Tulsa University

# RPSEA DW 1701-Improved Recovery (Reservoir)

**Description:** Systematically determine the potential and technical gaps to the application of improved reservoir recovery technologies to deepwater GOM.

**Application:** Improve recovery factors from the 15-25% currently achieved in these GOM reservoirs.



**Objectives:** Perform initial 2 phases of a 5 phase program to improve recovery factors. Document the incentives and technical needs for improving recovery. Establish baseline information. High grade applicable recovery techniques through analogue studies and lab tests.

**Value / Impact:** Determining effective recovery techniques early allows field developments to be configured to implement the technologies.

**Results / Accomplishment:** Characterize reservoirs by category, reserves, and recovery factor and estimate improved recovery potential. Identify the causes of trapped reserves and techniques (with gaps) to improve recovery. Plan next phases to close gaps and validate effectiveness of IOR.

Champion: Anadarko/Chevron/Total/BP  
Budget: \$ 2,000,000

Contractor: Knowledge Reservoir  
RPSEA: \$ 1,600,000

# RPSEA DW 1801- Effect of Global Warming on Hurricane Activity

**Description:** Using recent models hindcast hurricane activity and then under different scenarios forecast hurricane impact and compare to GOM facility design criteria.

**Application:** Determine if GOM facility design criteria is adequate for different weather scenarios.



Tropical Depression Bill (GOM)

**Objectives:** Assess the threat that global warming will increase Gulf hurricane activity.

Perform a sensitivity study to better understand the factors governing wave generation in very severe hurricanes.

**Value / Impact:** Most hurricane impacts could be mitigated with proper planning provided we know far enough in advance what to expect.

**Results / Accomplishment:** Two reports, one documenting the climate modeling and the other, the wave modeling

Champion: C Cooper (CVX) & D Driver (BP)  
Budget: \$ 700,000

Contractor: UCAR  
RPSEA: \$ 560,000

# RPSEA DW 1901- Subsea Processing System Integration Engineering

**Description:** Identify and address the technologies and any gaps for the Coyote field development using subsea production technology.

**Application:** Risk reduction through facility Design for Reliability will improve SS processing field development utilization.



**Objectives:** Through field development studies demonstrate the facility arrangements and technical readiness levels of SS production systems. Determine field economics and how future expansion of SS system would enhance development.

**Value / Impact:** Integrates existing SS Processing work to demonstrate readiness and risk levels. Areas needing further work will be identified.

**Results / Accomplishment:** SS Processing field development studies using Design for Reliability techniques will quickly demonstrate the technology readiness and directions for any more work.

Champion: C Haver (CVX)

Budget: \$ 1,500,000

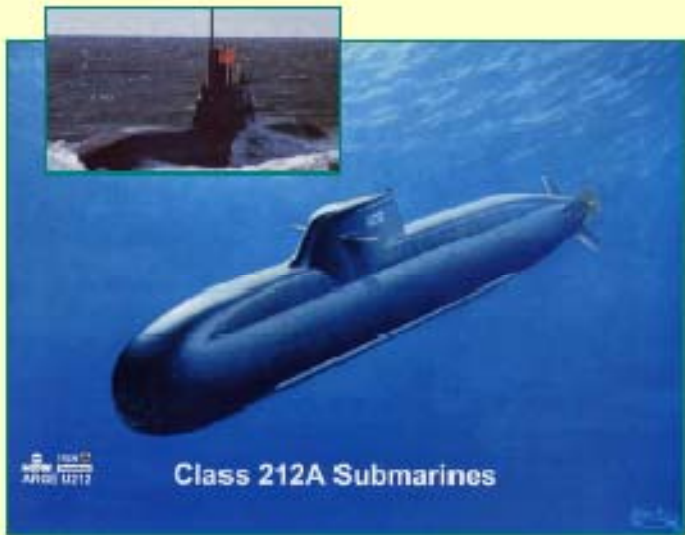
Contractor: GE

RPSEA: \$ 1,200,000

# RPSEA DW 1902- Deep Sea Hybrid Power Systems (Initial Study)

**Description:** Evaluate various seafloor based power production facilities to support field developments.

**Application:** SS power generation may power SS production facilities and has potential to produce environmentally friendly power for surface facilities.



Fuel Cells and Nuclear Propulsion

**Objectives:** Perform a feasibility assessment of various SS based generation and energy storage devices capable of providing power as required by production facilities.

**Value / Impact:** Improves potential for standalone SS developments. May provide environmentally friendly power to surface facilities. Such seabed facilities would reduce facility topside loads.

**Results / Accomplishment:** A technical screening of alternative power systems complete with a risk assessment will recommend a suitable system. Further development plans will be prepared.

Champion: C Haver (CVX)  
Budget: \$ 600,000

Contractor: HARC  
RPSEA: \$ 480,000