



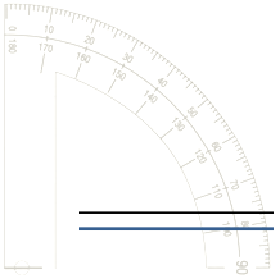
FACA review

RPSEA; 2010 Annual Plan Overview

C. Michael Ming
Hani Sadek; VP, UDW
September 16/17, 2009



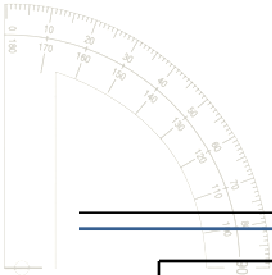
Secure Energy for America



2010 Draft Annual Plan & Program Updates

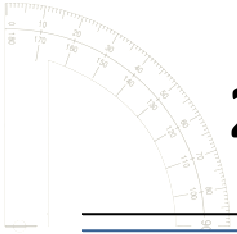
- Continued aggressive engagement of the private sector and research communities to enhance the value of the public/ private model created by EPACK Section 999
- Focus on building, maintaining, and managing an optimal and integrated portfolio
- Transition from program planning to program execution
- The 2010 Draft Annual Plan (dAP) is an evolutionary product of the 2007 through 2009 dAPs which laid the foundation for the current R&D portfolio
- Significant increase in proposals from 2007 to 2008
- 2009 UNG & SP RFPs posting is imminent

2007 Portfolio Overview



2007 Program Selections				
	Small Producer	Unconventional Resources	Ultra-Deepwater	Total
Universities	6	13	5	24
For Profits	0	1	8	9
Non-Profits	0	1	4	5
National Labs	1	2	0	3
State Agencies	0	2	0	2
Total Selected	7	19	17	43 *

* 42 of 43 awarded



2008 Ultra Deepwater Program Solicitation

Number of Proposals

	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	15	0	1	0	8	24
Selected	8	0	1	0	2	11*
Awarded						0

* 2 additional selections pending

Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	32,713	24,529	8,184	25
Selected	13,540	10,748	2,790	21



2008 Unconventional Resources Program Solicitation

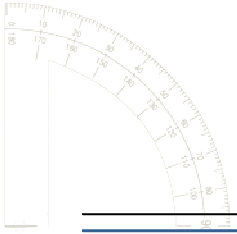
Number of Proposals

	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	22	2	5	5	35	69
Selected	1	1	2	0	5	9
Awarded	1		2		3	6

Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	103,892	49,941	53,951	52
Selected	28,592	18,361	10,231	36

2008 Small Producer Program Solicitation

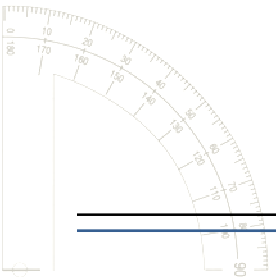


Number of Proposals

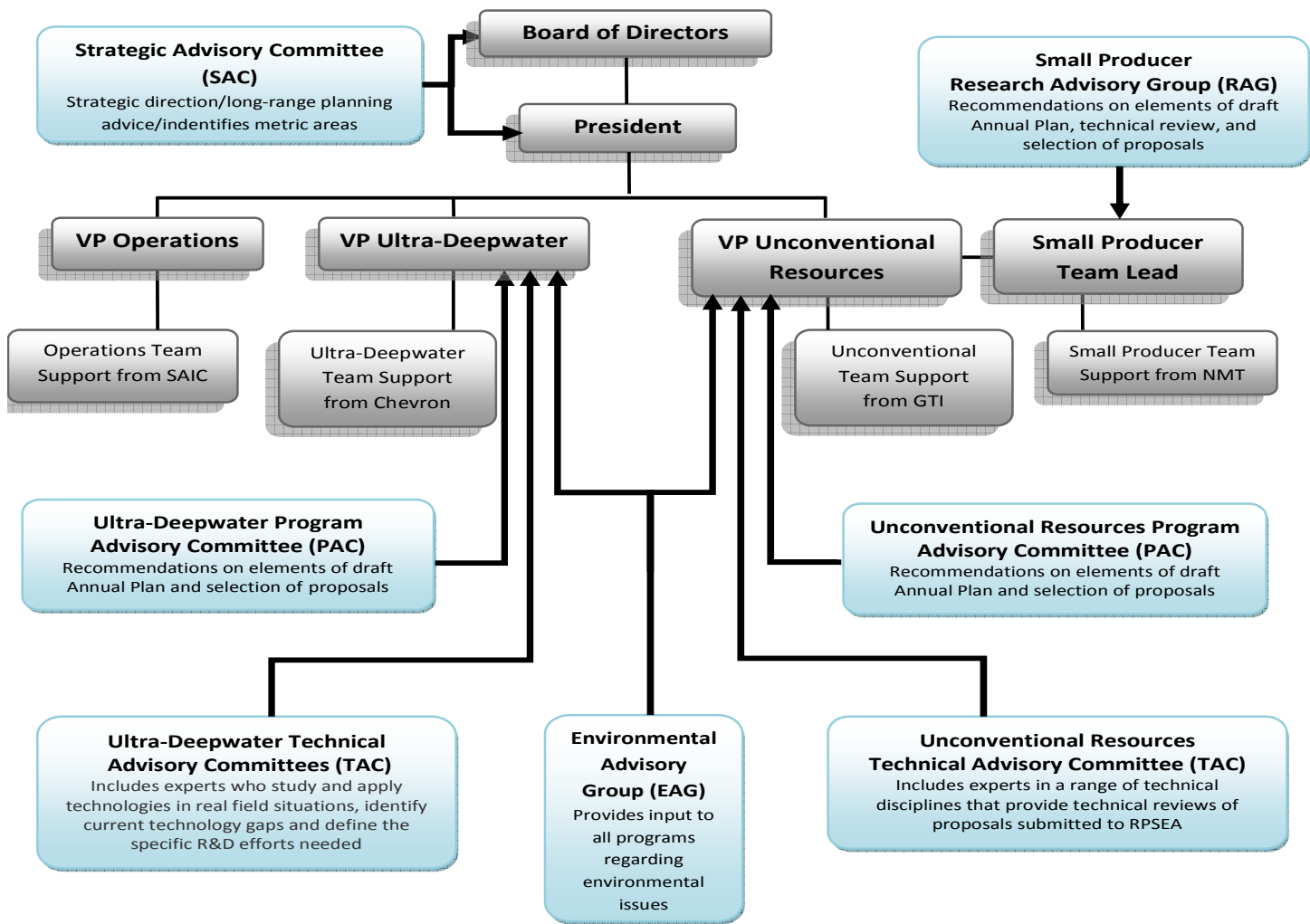
	For Profits	National Labs	Non Profits	State Agencies	Universities	Total
Received	7	2	1	0	7	17
Selected	2	0	0	0	4	6
Awarded					1	1

Proposal Value (\$000)

	Total Value	RPSEA Share	Cost Share	Cost Share %
Received	17,059	8,993	8,066	47
Selected	6,847	3,141	3,706	54



RPSEA Organization

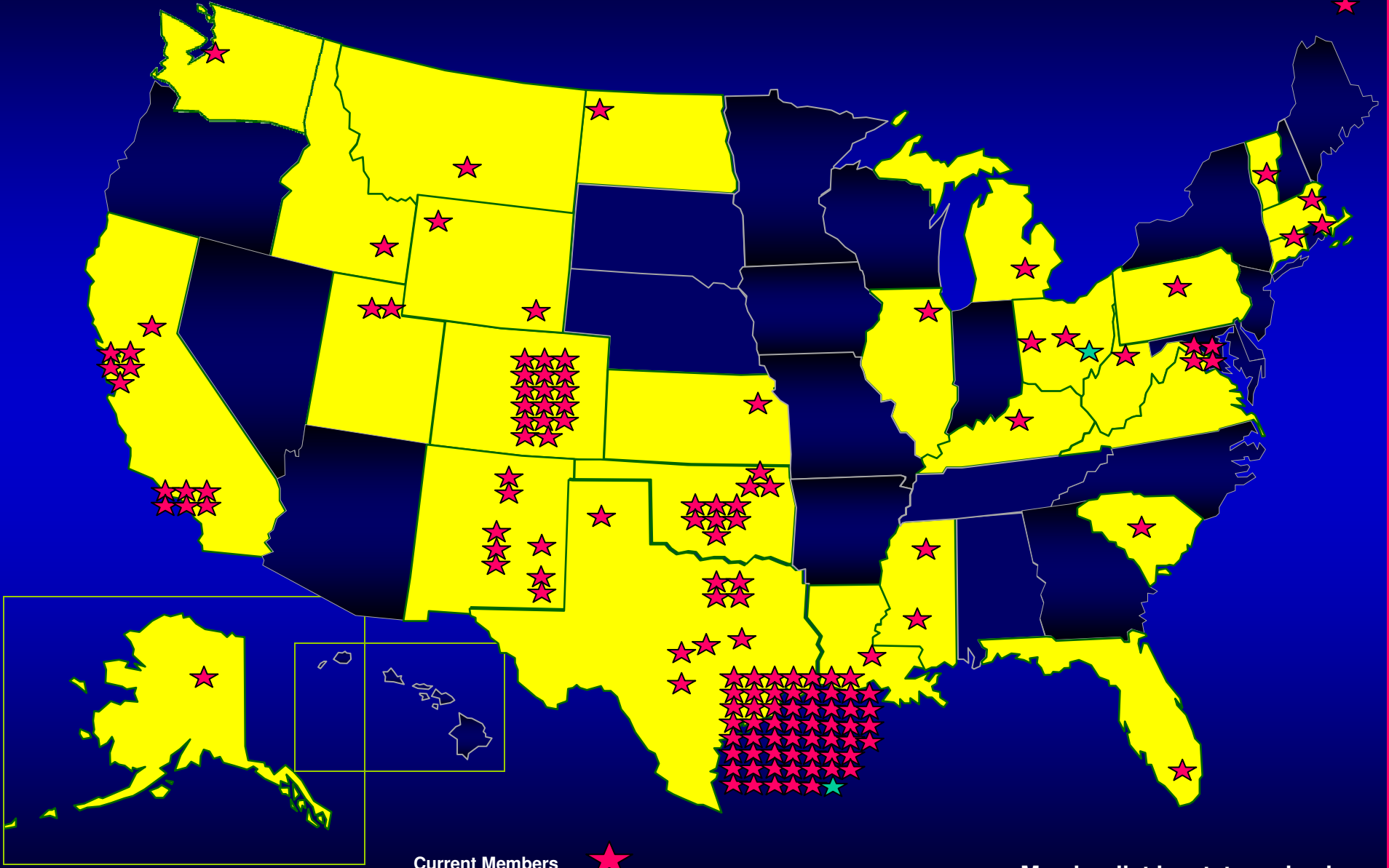






RPSEA 2010 dAP Stakeholder Involvement

- **Since inception**
 - **75 advisory committee and other meetings with:**
 - **1,838 participants**
 - **6,800 hours**
 - **25 RPSEA member forums with:**
 - **1,335 attendees**
 - **Total 11,800 hours**

RPSEA Members



Current Members 
Pending Members 

Member list by state on back

Alaska

University of Alaska Fairbanks

California

AeroVironment, Inc.
Campbell Applied Physics
Chevron Corporation
Conservation Committee of California Oil & Gas Producers
Delco Oheb Energy, LLC
Drilling & Production Company
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Natural Carbon, LLC
Stanford University
University of Southern California
Watt Mineral Holdings, LLC

Colorado

Altira Group LLC
Bill Barrett Corporation
Brownstein Hyatt Farber Schreck, LLP
Colorado School of Mines
Colorado Oil & Gas Association
DCP Midstream, LLC
The Discovery Group, Inc.
Energy Corporation of America
EnCana Corporation
Gunnison Energy Corporation
HW Process Technologies, Inc.
Independent Petroleum Association of Mountain States
Leede Operating Company
NiCo Resources
Robert L. Bayless, Producer LLC
Spatial Energy
University of Colorado at Boulder

Connecticut

APS Technology, Inc.

Florida

Florida International University

Idaho

Idaho National Laboratory

Illinois

Gas Technology Institute

Kansas

The University of Kansas

Kentucky

NGAS Resources, Inc.

Louisiana

Louisiana State University

Massachusetts

Massachusetts Institute of Technology
Woods Hole Oceanographic Institution

Michigan

University of Michigan

Mississippi

Jackson State University
Mississippi State University

Montana

Nance Resources

New Mexico

Correlations Company
Harvard Petroleum Corporation
Independent Petroleum Association of New Mexico
Los Alamos National Laboratory
New Mexico Institute of Mining and Technology
New Mexico Oil & Gas Association
Sandia National Laboratories
Strata Production Company

North Dakota

Western Standard Energy Corporation

Ohio

NGO Development Corporation

The Ohio State University
Wright State University

Oklahoma

Chesapeake Energy Corporation
Devon Energy Corporation
Interstate Oil and Gas Compact Commission
K. Stewart Energy Group
Oklahoma Independent Petroleum Association
Petroleum Technology Transfer Council
The Fleischaker Companies
The University of Oklahoma
The University of Tulsa
Williams

Pennsylvania

The Pennsylvania State University

South Carolina

University of South Carolina

Texas

Acute Technological Services, Inc.
Anadarko Petroleum Corporation

Apache Corporation

Apex Spectral Technology
BP America, Inc.

Baker Hughes Incorporated
BJ Services

Cameron/Curtiss-Wright EMD
Capstone Turbine Corporation

CARBO Ceramics, Inc.

City of Sugar Land

ConocoPhillips Company

CSI Technologies, Inc.

Deepwater Structures, Inc.

Deepwater XLP Technology, LLP

Det Norske Veritas (USA)

Energy Valley, Inc.

ExxonMobil Corporation

GE/Vetco Gray

Granherne, Inc.

Greater Fort Bend Economic Development Council

GSI Environmental, Inc.

Halliburton

Houston Advanced Research Center

Houston Offshore Engineering, LLC

Houston Technology Center

Intelligent Agent Corporation

Knowledge Reservoir, LLC

Marathon Oil Company

M&H Energy Services

Merrick Systems, Inc.

Nalco Company

NanoRidge Materials, Inc.

National Oilwell Varco, Inc.

Nautilus International, LLC

Noble Energy, Inc.

OTM Consulting Ltd.

Oxane Materials, Inc.

Petris Technology, Inc.

Petrobras America, Inc.

Pioneer Natural Resources Company
QO Inc.

Quanelle, LLC

Rice University

Rock Solid Images

RTI Texas

Schlumberger Limited

Shell International Exploration & Production

Simmons & Company International

SiteLark, LLC

Southern Methodist University

Southwest Research Institute

StatoilHydro

Stress Engineering Services, Inc.

Technip

Technology International

Tejas Research & Engineering, LP

Tenaris

Texas A&M University

Texas Energy Center

Texas Independent Producers and Royalty Owners Association

Texas Tech University

The University of Texas at Austin

Titanium Engineers, Inc.

TOTAL Exploration Production USA

University of Houston

VersaMarine Engineering, LLC

Weatherford International Ltd.

Utah

Novatek, LLC

The University of Utah

Vermont

New England Research, Inc.

Virginia

Advanced Resources International, Inc.

American Gas Association

Independent Petroleum Association of America

Integrated Ocean Drilling Program

Washington

Quest Integrated, Inc.

West Virginia

West Virginia University

Wyoming

EnerCrest, Inc.

WellDog, Inc.

Newfoundland, Canada

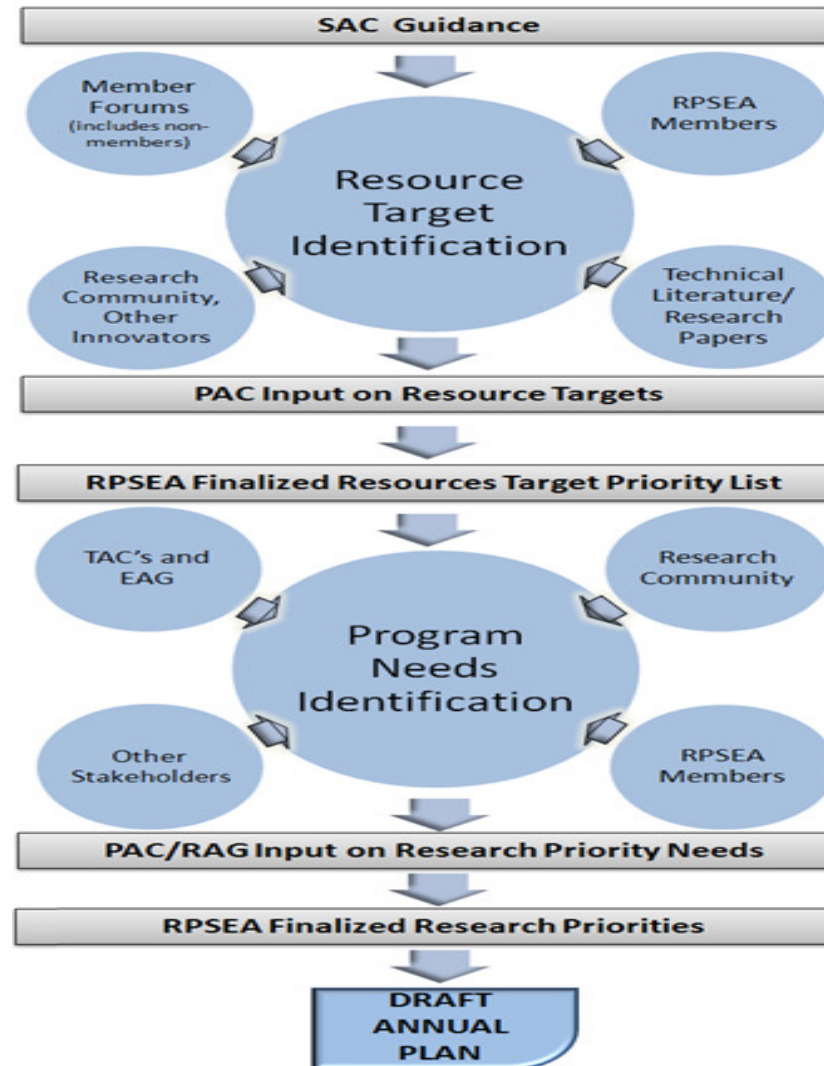
Centre for Marine CNG, Inc.

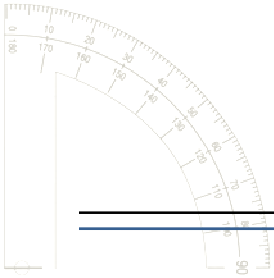


RPSEA 2010 dAP Objectives

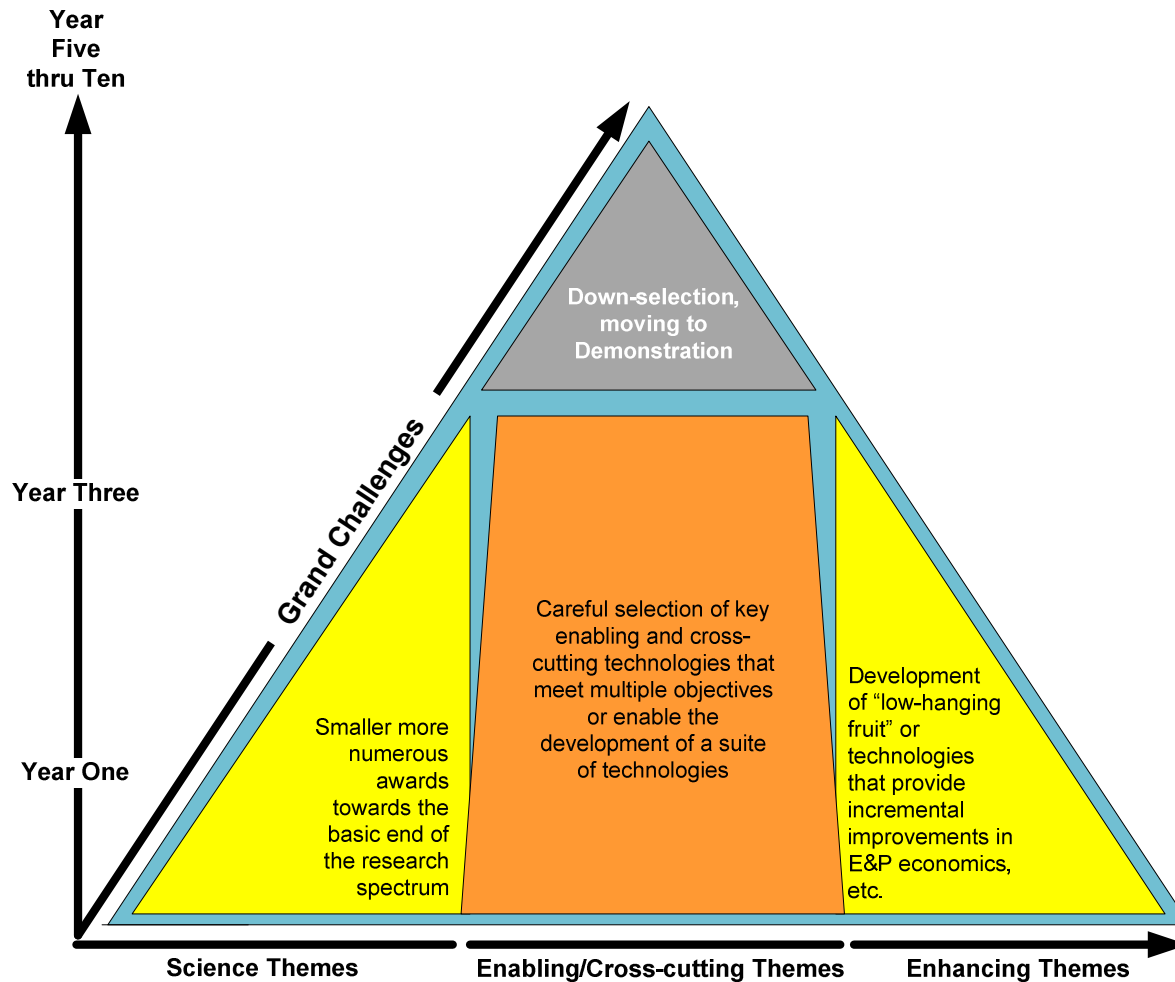
- **Meet EPACK 2005 objectives**
- **Enhance the traditional iterative industry process by:**
 - **Developing a time scaled R&D process**
 - **Identifying and enabling the relevant scientific overlay not feasible with pure market driven efforts**
 - **Facilitate collaboration among industry and researchers through integrated projects in a well designed integrated portfolio**

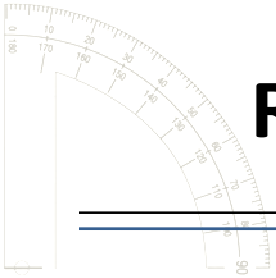
RPSEA 2010 dAP Process Flow





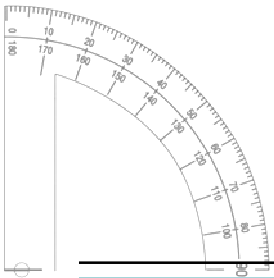
RPSEA 2010 dAP Portfolio Guidance





RPSEA 2010 FACA Presentation Outline

- **Environmental emphasis for the overall program**
 - **Environmental Advisory Group (EAG) description by Rich Haut**
- **Individual program presentations will include:**
 - **Resource drivers**
 - **Portfolio development specific to each program**
 - **Program status**
 - **2010 R&D plan**
 - **Technology transfer**



RPSEA; Annual Plan overview



Executive Summary

1. Background

2. Overall Implementation Scheme

2.1 Ultra-Deepwater Program Element

2.2 Unconventional Natural Gas

2.3 Small Producer Program Element

2.4 Solicitation Process

2.5 Project Management

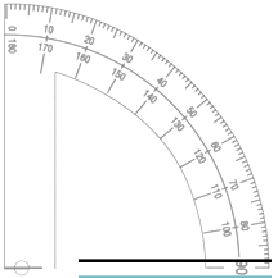
2.6 Technology Transfer

2.7 Performance Metrics and Program Benefits Assessment

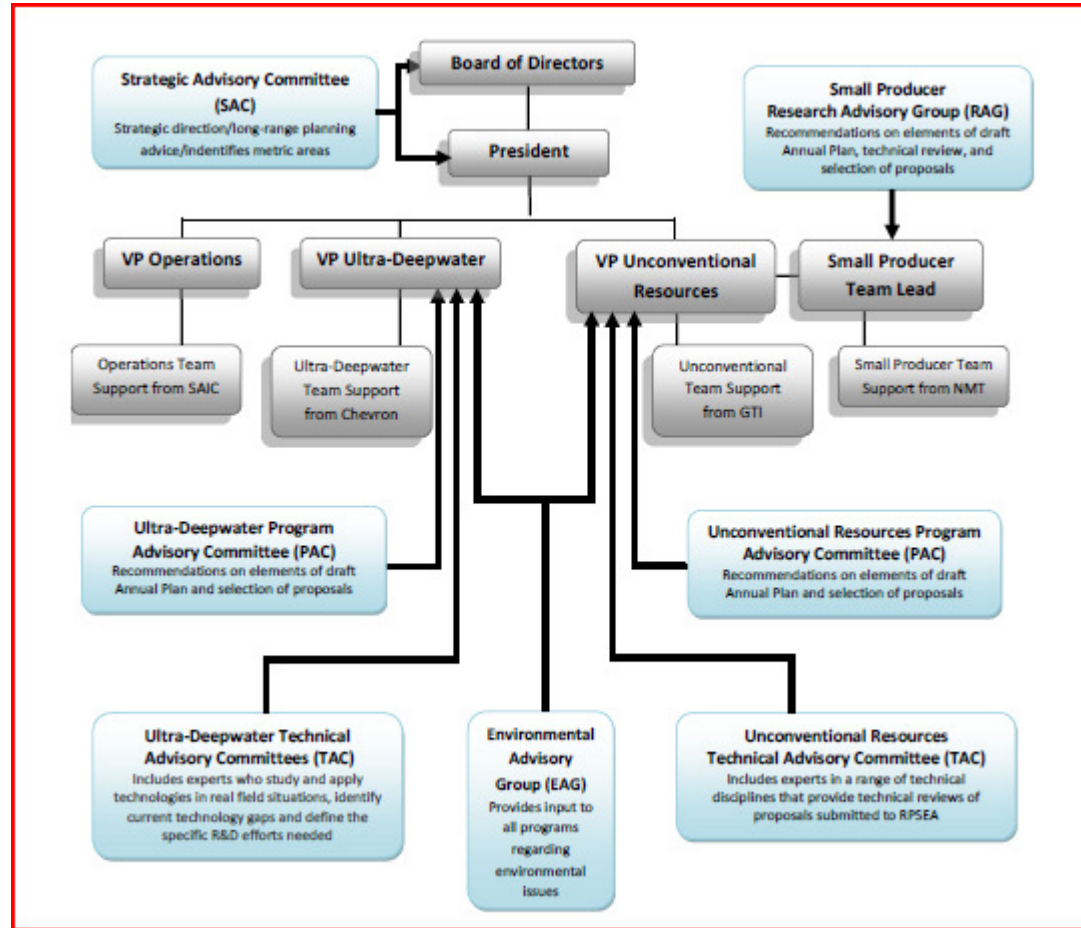
Appendix A: Title IX, Subtitle J of EPL Act 2005
Sections 999A through 999H

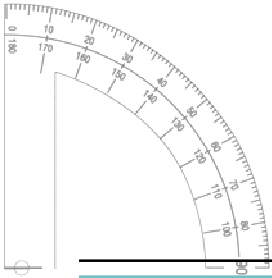
Appendix B: RPSEA Membership and
Committee List

Appendix C: RPSEA 2010 Draft Annual Plan



RPSEA Organization and Advisory Committees





RPSEA UDW Structure PAC and TACs

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

Program Advisory Committee
“PAC”

Regulatory TAC (X100)
51 Active Members

Subsea Systems TAC (X300)
138 Active Members

Drilling & Completions TAC (X500)
66 Active Members

Met Ocean TAC (X800)
55 Active Members

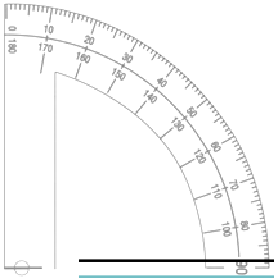
Flow Assurance TAC (X200)
100 Active Members

Floating Systems TAC (X400)
150 Active Members

Reservoir Engineering TAC (X700)
44 Active Members

Systems Engineering TAC (X900)
76 Active Members

Geoscience TAC (X000)
15 Active Members



International Collaboration UDW Program Input

International



Professional Societies

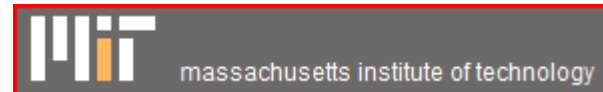


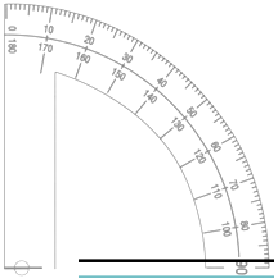
RPSEA; Invited Organization

Regional and local



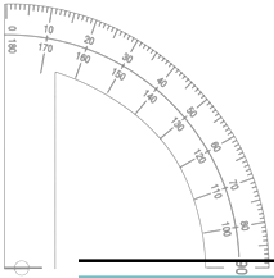
Universities





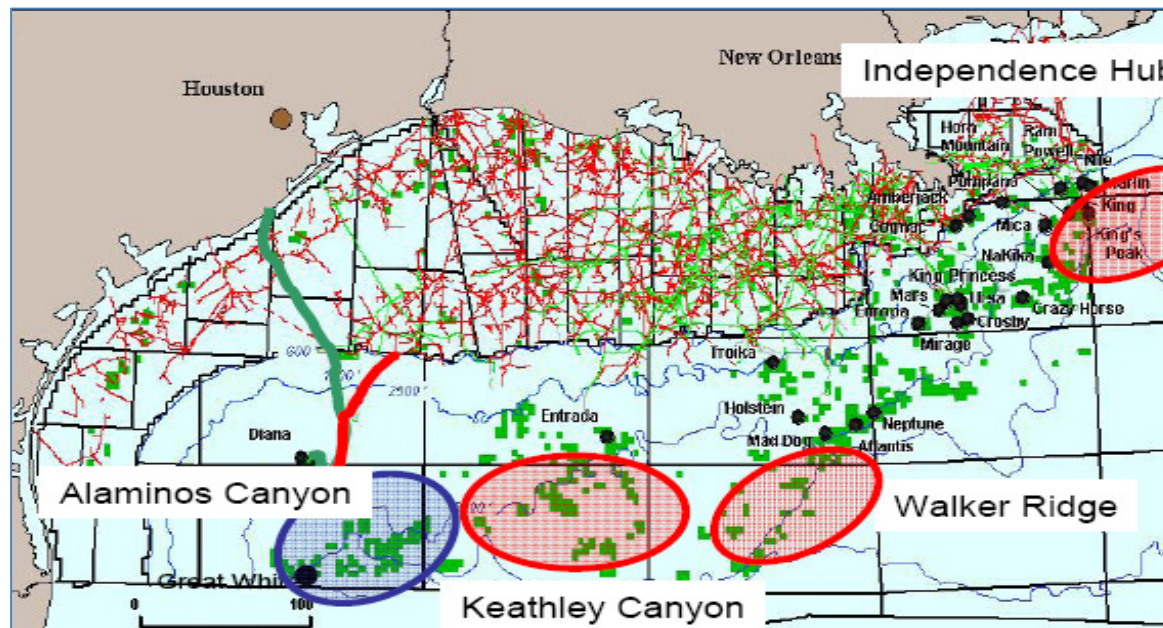
UDW Program is “Technology and Architecture Focus”





UDW Program Approach

Four base-case field development scenarios



The Challenges

Walker Ridge/Keathley Canyon

- subsalt
- deeper wells
- tight formations

Alaminos Canyon

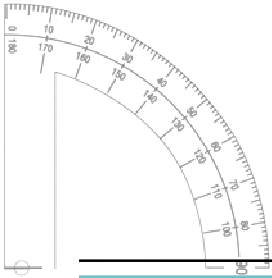
- viscous crude
- lacking infrastructure

Eastern Gulf – Gas Independence Hub

- higher pressure & temperature
- CO₂/H₂S

Overall

- higher drilling costs
- challenging economics



Increasing Lag Between Discovery and Development

Proven Reserves Add Value

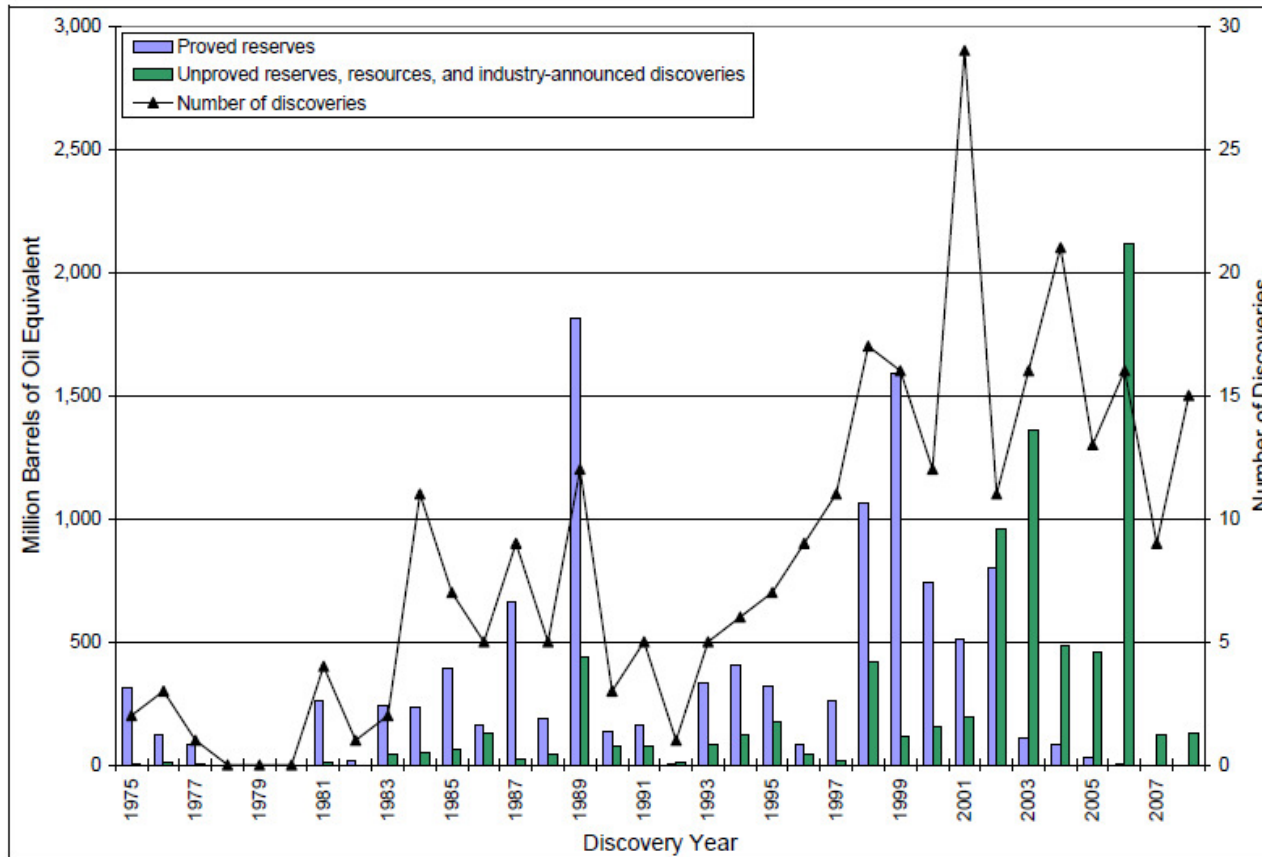
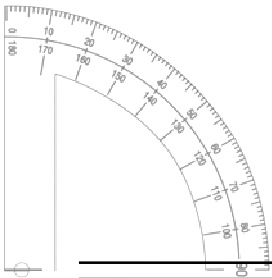
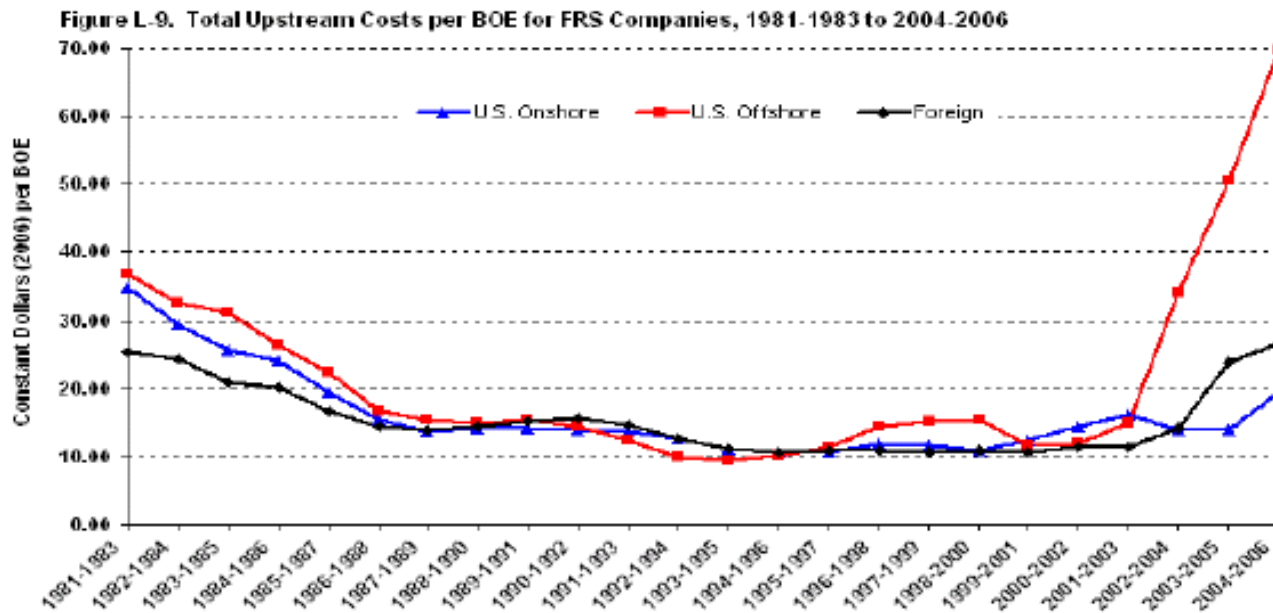


Figure 22. Number and volume of deepwater discoveries. Volumes include MMS reserves, MMS resources, and industry-announced discoveries.

MMS Report 2009 – 016: Deepwater Gulf of Mexico 2009. (continuing trend from 2008-013 report)

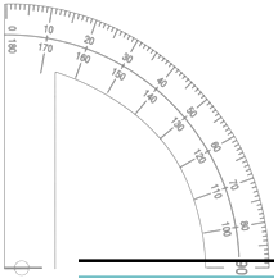


Need to reduce costs



Notes: Costs are the quotient of costs and reserve additions for each three-year period. BOE = Barrels of oil equivalent.
 Source: Energy Information Administration, Form EIA-28 (Financial Reporting System).

Figure 5. Cost per Barrel of Oil Equivalent (BoE) per US Department of Energy, Energy Information Agency (EIA) January 2008, for companies reporting to EIA's Financial Reporting System (FRS). It does not include state-owned oil companies. <http://www.eia.doe.gov/neic/infosheets/crudeproduction.html>

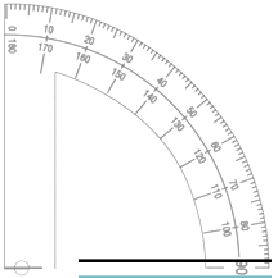


UDW Program Goal

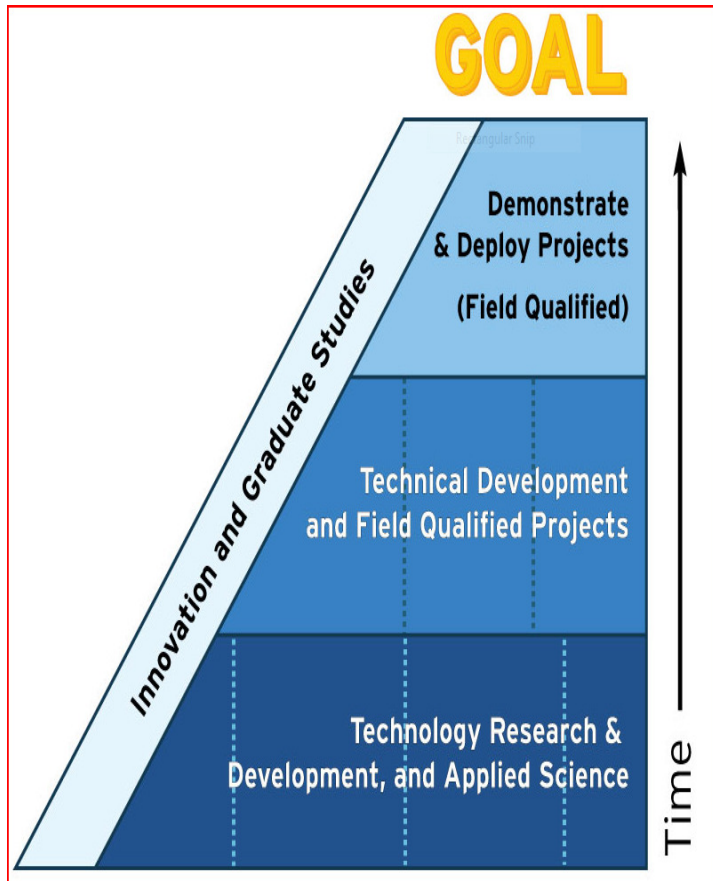
The goal of the UDW is to exploit the ultra-deepwater resource base and ***to convert currently identified (discovered) resources into economic recoverable (proven) reserves***, while protecting the environment, thereby providing the U.S. consumer with secure and affordable petroleum supplies.

This goal will be achieved by:

- Increasing production of ultra-deepwater oil and gas resources
- Reducing costs & cycle time to find, develop, and produce such resources
- Increasing the efficiency of exploitation of such resources
- Increasing production efficiency and ultimate recovery of such resources
- Improving safety and environmental performance by minimizing environmental impacts associated with ultra-deepwater exploration and production



UDW Program Objectives



Near Term

Objective 1: Ongoing Identification of Technology UDW Needs

Objective 2: Technology Research & Development, & Applied Science

Objective 3: Awareness and Cost-Share Development.

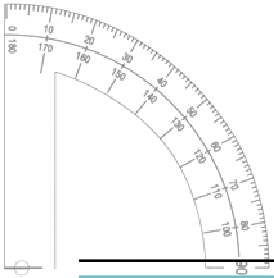
Longer Term

Objective 4: Technical Development and Field Qualified

Objective 5: Environmental & Safety Technology Development & Deployment

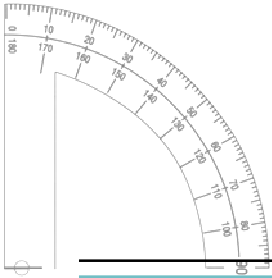
Objective 6: Technology Demonstration.

Objective 7: Technology Commercialization and Industry Deployment



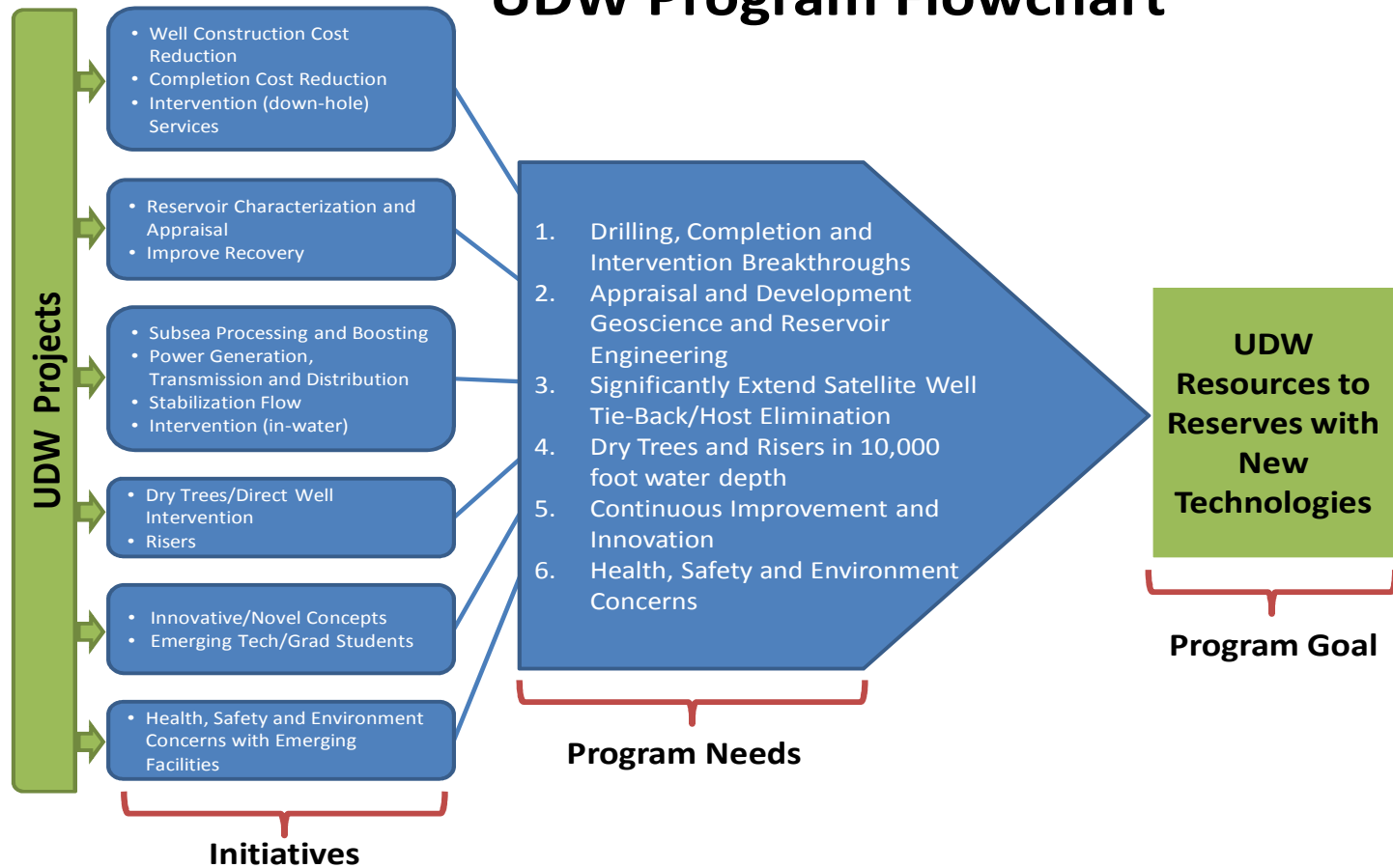
UDW Program 'Needs'

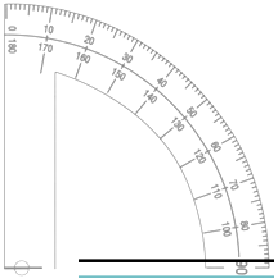
1. Drilling, completion and intervention breakthroughs
2. Appraisal & development geoscience and reservoir engineering
3. Significantly extend subsea tieback distances & surface host elimination
4. Dry trees/direct well intervention and risers in 10,000' wd
5. Continuous improvement / optimize field development
 - Per wellbore recovery
 - Cost reduction
 - Reliability improvements
 - Efficiency improvements
6. Associated safety and environmental trade-offs



UDW Program Approach

UDW Program Flowchart





Programmatic approach “Need 1” (drilling) Example

Need 1: Drilling, Completion, and Intervention Breakthroughs

Benefit: Drilling, completion, and intervention costs now represent 50 to 70 percent of the total capital expenditures on UDW projects. With ultra-deepwater drilling spread cost exceeding \$1 million per day, significant cost reduction is required for UDW project viability.

Initiative 1: Well Construction Cost Reduction

Target: Reduce ultra-deepwater drilling costs by 30 percent

DW1501 (2007): Extreme Reach Development (not awarded – to be re-bid in 2010)

This project will conceptualize the tools and service capabilities required to safely drill, complete, produce, maintain, and at end of life abandon reservoirs located up to 20 miles away from the surface facilities and well access point.

DW2501 (2008): Early Reservoir Appraisal Utilizing a Low Cost Well Testing System (Note: This project also supports Need #2, Initiative 1: Reservoir Characterization and Appraisal)

DW2502 (2008): Modeling and Simulation of Managed Pressure Drilling (MPD)

This project will expand existing capabilities for analysis and simulation of MPD ultra-deepwater well design and operations.

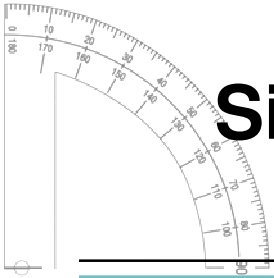
DW35xx (2009): Drilling

Proposals under this drilling initiative are expected to have the potential to significantly reduce the cost of UDW well drilling operations.

Concepts addressed may include:

- To reduce the single MODU spread cost
- To reduce the total well count ...
- A longer-term approach may be to develop a seafloor based drilling rig

DW45xx (2010): Extreme Reach Development



Significant Demand for UDW Technology Funding

April, 2007

120+ Project Ideas
\$300 MM

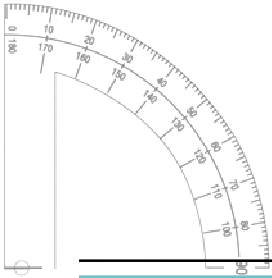
June, 2007

70 Project Ideas
\$175 MM

July, 2007

26 Project Ideas
\$30 MM

RPSEA 2007 & 2008 Projects



2007 UDW Projects

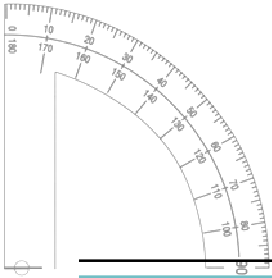
Project	Project Title	Contracted; lead	Award (RPSEA portion)
DW1201	Wax Control	University of Utah	\$400,000
DW1301	Improvements to Deepwater subsea measurements	Letton Hall Group	\$3,564,000
DW1302	High Conductivity Umbilicals	Technip	\$448,000
DW1401	Composite Riser for UDW High Pressure Wells	Lincoln Composites	\$1,680,000
DW1402	Deepwater dry tree system for drilling production	FloTec / Houston Offshore	\$936,000
DW1403	Fatigue Performance of High Strength Riser Materials	SwRI	\$800,000
DW1501	Extreme Reach Development	Tejas (unable to contract - \$200,000)	
DW1603	Design investigation xHPHT, SSSV	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	Knowledge Reservoir	\$1,600,000
DW1801	Effect of Global Warming on Hurricane Activity	NCAR	\$560,000
DW1901	Subsea processing System Integration	GE Research	\$1,200,000
DW1902	Deep Sea Hybrid Power Systems:	HARC	\$480,000
DW2001	Geophysical Modeling Methods	SEG	\$2,000,000

15 awarded

\$14,148,000

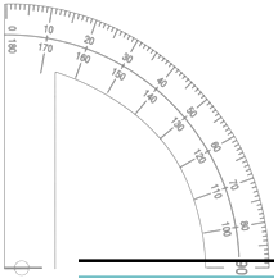
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2008 UDW Projects

Project	Project Title	Selected; lead	Approx. RPSEA share
DW 2101	New Safety Barrier Testing Methods	Southwest Research Institute	\$128,000
DW 1202	EOS improvement for xHPHT	NETL (\$1,600, 00)	
DW 2201	Heavy Viscous Oils PVT for Ultra-Deepwater	Schlumberger Limited	\$460,000
DW 2301	Riserless Intervention System (RIS)	DTC International	\$3,411,500
DW 1502	Coil Tubing, Drilling and Intervention Systems Using Cost Effective Vessel	Nautilus International, LLC	\$820,000
DW 2501	Early Reservoir Appraisal, Utilizing a Well Testing System	Nautilus International, LLC	\$880,000
DW 2502	MPD; Advanced Steady-State and Transient, Three-Dimensional, Single and Multiphase, Non-Newtonian Simulation System for Managed Pressure Drilling	Stratamagnetic Software, LLC	\$384,000
DW 2701	Resources to Reserves Development and Acceleration through Appraisal	TBA	\$400,000
DW 2801	Gulf 3-D Operational Current Model Pilot	TBA	\$1,248,000
DW 2901	Ultra-Reliable Deepwater Electrical Power Distribution System and Power Components	GE Global Research	\$4,811,000
DW2902-02	Technologies of the Future for Pipeline Monitoring and Inspection	University of Tulsa	~ \$150,000
DW2902-03	Wireless Subsea Communications Systems	GE Global Research	~ \$150,000
DW2902-04	Replacing Chemical Biocides with Targeted Bacteriophages in Deepwater Pipelines and Reservoirs	Phage Biocontrol, LLC	~ \$150,000
DW2902-06	Enumerating Bacteria in Deepwater Pipelines in Real-Time at a Negligible Marginal Cost Per Analysis: A Proof of Concept Study	Livermore Instruments, Inc.	~ \$150,000
DW2902-07	Fiber Containing Sweep Fluids for Ultra-Deepwater Drilling Applications	University of Oklahoma	~ \$150,000
15 Projects		13 selected	\$12,542,500

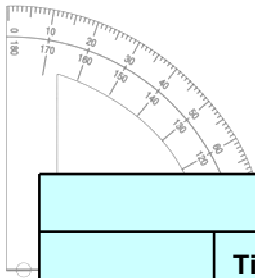


2009 UDW Plan Strategy

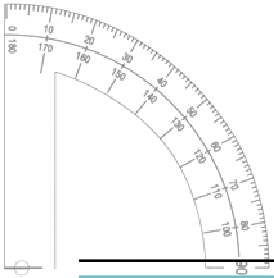
- 6 Initiative-based RFPs (6 to 10 project awards)
- Unlike 2007 and 2008, UDW TACs have not voted for individual projects. Rather, the TACs prioritized project ideas by initiatives.
- This input was evaluated by the PAC to decide appropriate balance for 2009 UDW program.
- UDW 2009 RFPs will consist of both specific projects and broader initiative-based requests.
- Timing; anticipate release of RFPs September 2009 with 60 day clock, selection 1Q2010 and awards 2Q2010



2009 UDW Funding

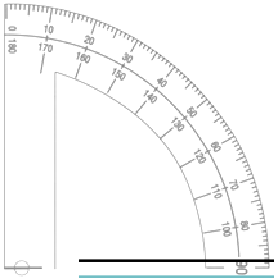


RPSEA YR3 Funding Allocation (2009)		Funding Distribution (\$k)		
	Title / Description	Low	High	Average
Need #1	Drilling Completion and Intervention Breakthroughs			6,250
1	Drilling	2,000	5,000	3,500
2	Completions	1,000	3,000	2,000
3	Intervention (Downhole Services)			-
4	Intervention (In-Water IMR)	500	1,000	750
5	Extended Well Testing			-
Need # 2	Appraisal & development geosciences and reservoir engineering			1,500
6	Reservoir Surveillance	1,000	2,000	1,500
Need #3	Significantly extend subsea tieback distances / surface host elimination			3,625
7	Stabilized Flow	750	1,500	1,125
8	Subsea Power			-
9	Subsea Processing, Pressure Boosting, Instrumentation and Controls	2,000	3,000	2,500
Need #4	Dry trees / Direct well intervention and risers in 10,000' wd.			-
10	Riser Systems			-
11	Dry Tree Structures			-
Need #5	Continuous Improvement / Optimize field development			3,000
12	Long Term Research and Development and Graduate Student Program	1,000	2,000	1,500
13	Sensors, tools and Inspection Processes	1,000	2,000	1,500
14	Bridging and Contingency	500	750	625
Need #6	Associated Safety and Environmental Concerns			500
15	Environmental Issues	250	750	500
		10,000	21,000	14,875



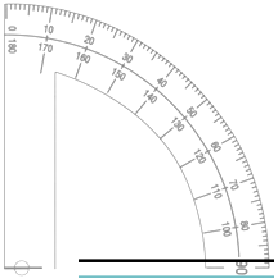
2010 UDW RFPs

- ~ \$15 million (RPSEA) + cost share available for project awards.
- Target funding of three to five large projects, with a value of \$1 million to \$5 million / project.
 - Additionally, a number of smaller awards averaging \$150 - \$300K thousand under Need 5: Continuous Improvement and Innovation.
 - Each project will have a duration of one to three years.
- Projects will be aligned with the six UDW needs.
- Project integration across multiple disciplines will be encouraged (e.g. geoscience, reservoir and drilling, or flow assurance and subsea).
- Proposed UDW 2010 RFPs can be categorized into three types:
 - 1.Next phase projects based on completed projects from the 2007 and 2008 program
 - 2.Specific project ideas to fill-in identified technical gaps
 - 3.Graduate student and innovative /novel projects



2010 UDW Activities

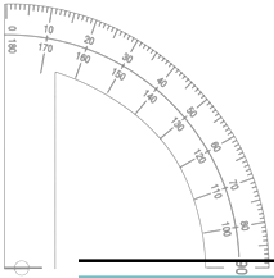
- Project management & technology transfer; 2007 and 2008 projects.
- Bid, review, select, negotiate & award 2009 projects
- Bid, review, select, negotiate & award 2010 projects
- Gather input, review and adjust as appropriate Program objectives and technology needs
- Prepare 2011 draft Annual Plan
- Collaborate with NETL Complementary and Metrics Program
- Address input & issues from FACA and government agencies (MMS, USCG, GAO, etc.) and NGOs



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

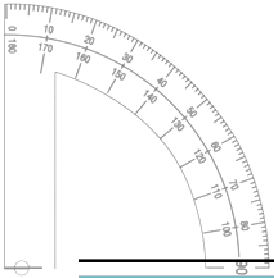




Project-Level Technology Transfer

- 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

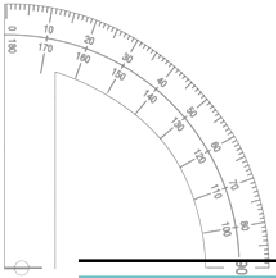




Program-Level Technology Transfer

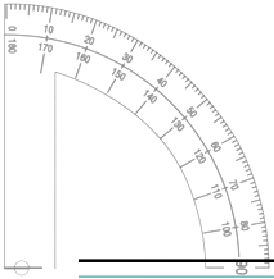
- Funded by 1% Set-aside
- Managed by RPSEA
 - Website Enhancements
 - Coordination with NETL KMD,
 - Events at Major Technical Conferences (SPE, OTC, SEG, etc.)



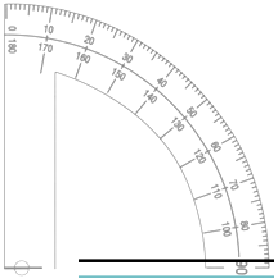


Questions?



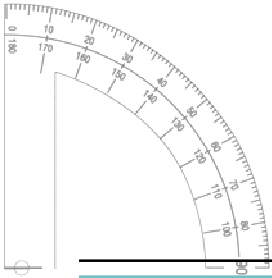


Back-ups



Timeline

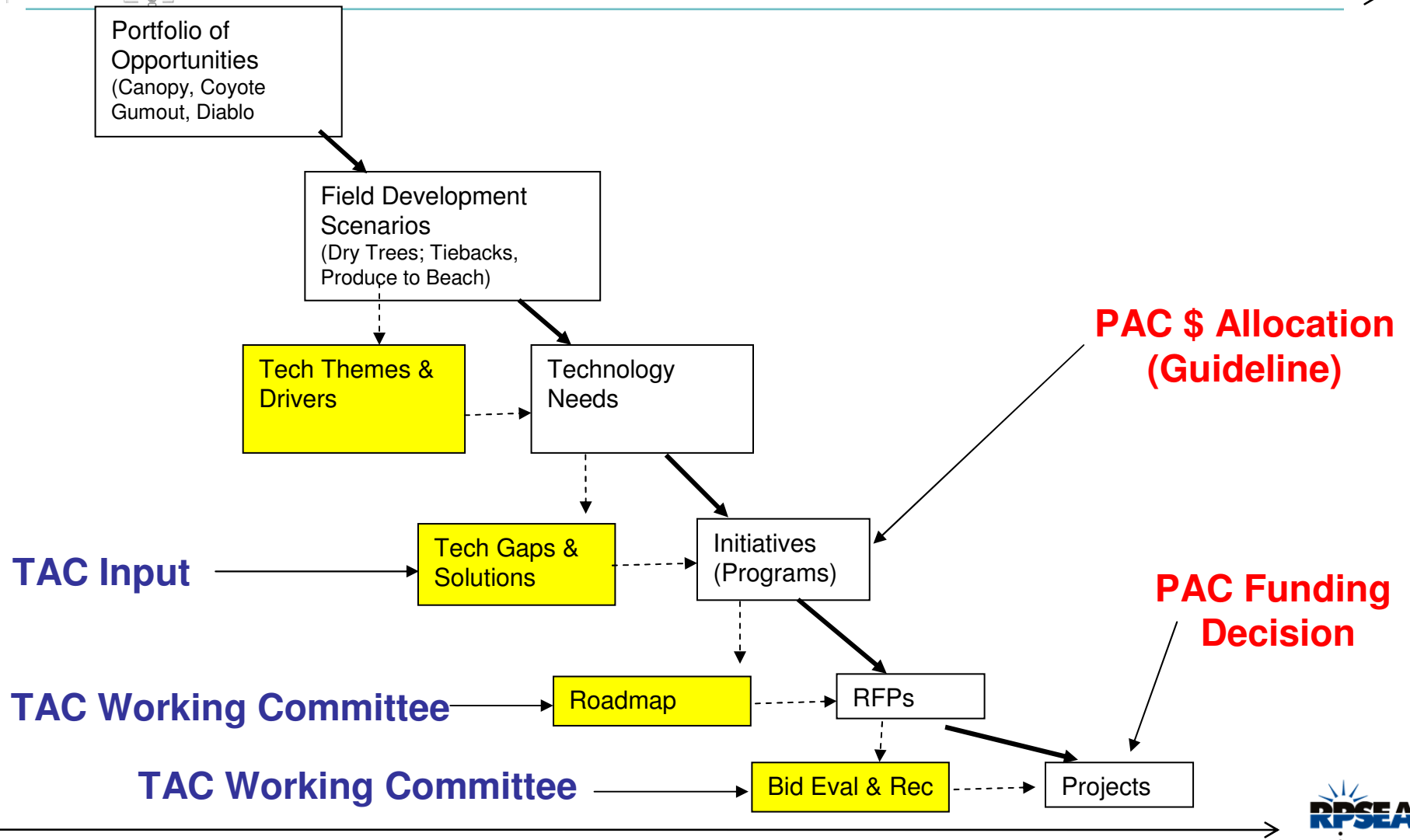
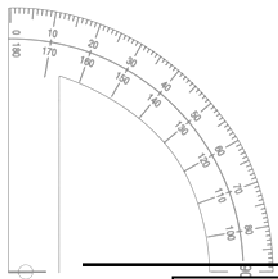
2010 Consortium Process Timeline															
Month		-2	-1	1	2	3	4	5	6	7	8	9	10	11	12
2010 Draft Plan Submitted (August 3, 2009)	♦														
Plan Published		♦													
Plan Approved					♦										
Obtain DOE Approval of Solicitation						♦									
Solicitation Open Period															
Proposal Evaluation and Selection															
DOE Approval															
Contract Negotiation and Award															
Manage 2010 Awards															
Manage 2007, 2008 & 2009 Awards															
Report Program Deliverables															
Conduct Technology Transfer Workshops & Activities															
Establish 2011 R&D Priorities & Annual Plan															

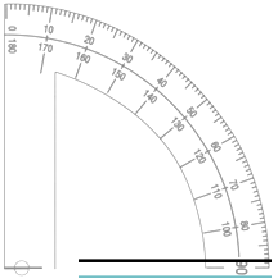


UDW Program status

Categories	2007 selected	2007 awarded	2008 selected	2008 awarded	2009
Universities	5	5	3		
National Laboratories	-	-			
Nonprofit Corporation	4	4	1		
For Profit Corporation	8	7	8		
Geological Science	-	-			
Total	16	15	13 (+ 2 more pending)	0	RFP release 9/09
RPSEA approx. totals		\$14.1MM	\$12.5MM		~\$15MM

UDW Program Process





2010 UDW

Need 1: Drilling, Completion, and Intervention Breakthroughs

Proposals may be requested identifying novel ideas to reduce well construction and completion costs and funding follow-on recommendations from 2007 and 2008 projects.

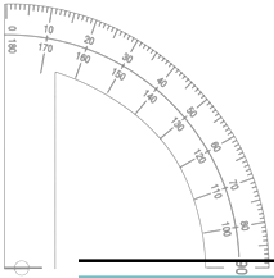
Need 2: Appraisal and Development Geoscience and Reservoir Engineering

Proposals will be requested in the area of formation and reservoir characterization and/or surveillance. The goal of this effort is to reduce the amount of unproduced hydrocarbons upon well or field abandonment, contributing to increased recovery.

Need 3: Significantly Extend Subsea Tieback Distances/Surface Host Elimination

Proposals may be requested addressing follow-on recommendations from 2007 and 2008 projects
New proposals may be requested in one or more of the following areas:

- Ultra-deepwater flow assurance especially for the areas of solids (asphaltenes, hydrates, waxes, and scale) deposition and plug formation management
- Pressure boosting
- AUV and intervention
- Subsea processing/produced water treatment



2010 UDW

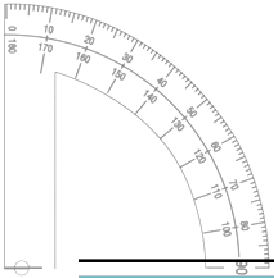
Need 4: Dry Trees/Direct Well Intervention and Risers in 10,000 foot Water Depth

This need area was addressed in the 2007 and 2008 UDW. Next phase proposals may be requested addressing recommendations from the 2007 and 2008 projects

Need 5: Continuous Improvement and Innovation

Proposals in this need area may include:

- Advancing industry understanding of phenomena and science impacting ultra-deepwater operations
- Improvements in integrity management and reliability
- Additional graduate student and project funding
- Innovative technology high risk, high reward “long-shot” opportunities



2010 UDW

Need 6: Associated Safety and Environmental Concerns

There is a tremendous amount of environmental research funded by the federal and state governments as well as private foundations. RPSEA will reach out to the environmental researchers and safety professionals, enabling them to understand the importance of their efforts with respect to U.S. domestic energy production. **RPSEA's focus is on technology development** and, as such, RPSEA will be focusing efforts to ensure new technology developed within the program takes environmental impact and safety considerations into account. In accomplishing this, RPSEA will be seeking to leverage ongoing research efforts, and collaborate within existing forums and venues, and where possible integrate with ongoing UDW projects.

Areas of study may include:

- Discharge of produced water subsea – technology and regulatory aspects
- Environmental impacts associated with technologies addressed under other UDW needs

RPSEA DW 2001- Synthetic Benchmark Models of Complex Salt

Description: Develop one or more synthetic data models to be used to benchmark new processing methods and tools to image reservoirs under complex salt structures.

Application: This data set will enable the quality verification and testing of imaging tools with a known result.



Objectives:

This project will contribute to geophysical imaging technology evolution. It will provide realistic benchmark geological models and associated synthetic seismic together with potential field data.

Value / Impact:

These models will allow industry to effectively and efficiently assess seismic (and other) acquisition and processing techniques for generating images of hydrocarbon reservoirs beneath massive, complex salt bodies.

Results / Accomplishment: The deliverables include this benchmark data set to be used by the developers of complex seismic processing tools.

Champion: P Williamson (Total) & C. Meeder (Marathon)

Contractor: SEAM

Budget: \$2,500,000

RPSEA: \$ 2,000,000



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

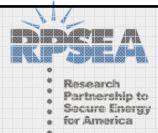
Expect resulting technologies to deliver a true comprehensive cold flow strategy without pipe insulation.

Champion: G. Shoup (BP)

Contractor: University of Utah

Budget: \$500,000

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)

Contractor: Letton Hall Group →

Budget: \$4,455,000

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.



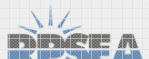
Objectives: Conceptualize power umbilical technologies to increase power capacity and decrease size and weight of umbilicals. Technologies may include nano-tubes and other promising alternatives.

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: Akin Oke (CVX)
Budget: \$560,000)

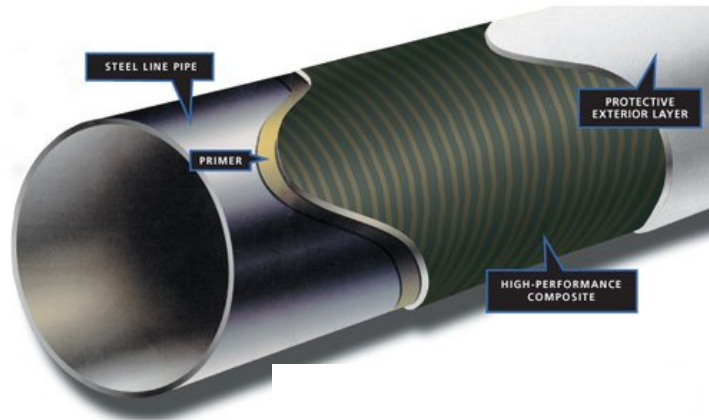
Contractor: Nano Ridge
RPSEA: \$ 448,000



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)

Contractor: Lincoln Composites

Budget: \$2,100,000

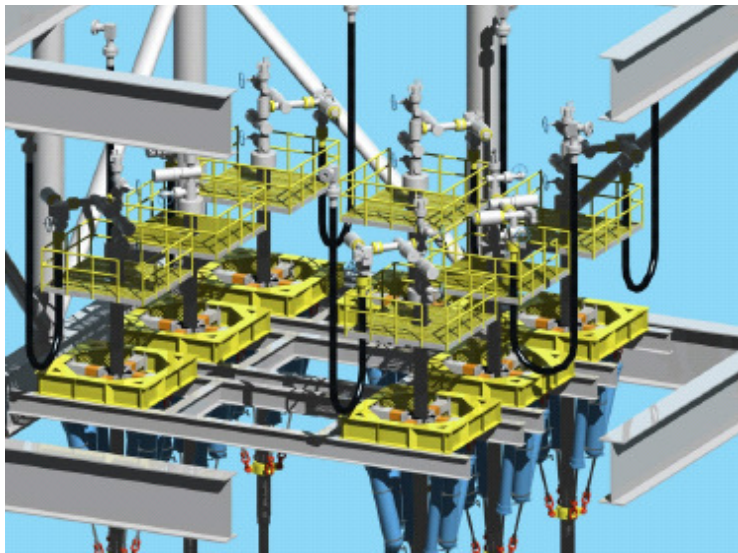
RPSEA: \$ 1,680,000



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

Contractor: FloTech/ Houston Offshore

Budget: \$1,170,000
Secure Energy for America

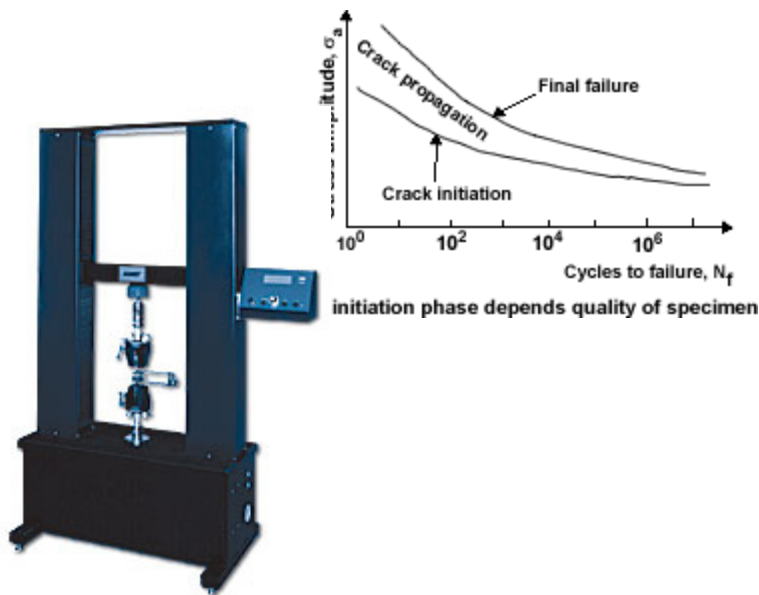
RPSEA: \$ 936,000 →



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)

Contractor: SwRI

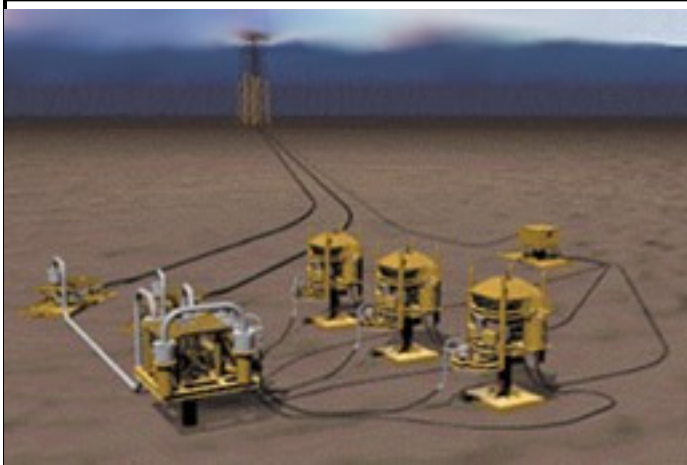
Budget: \$1,000,000

RPSEA: \$ 800,000

RPSEA DW 1501- Extreme Reach Development / **DROPPED**

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.

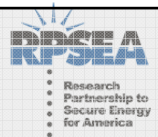
Results / Accomplishment: A conceptual design defining new (breakthrough) technologies offering alternative methods for satellite marginal field developments.

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

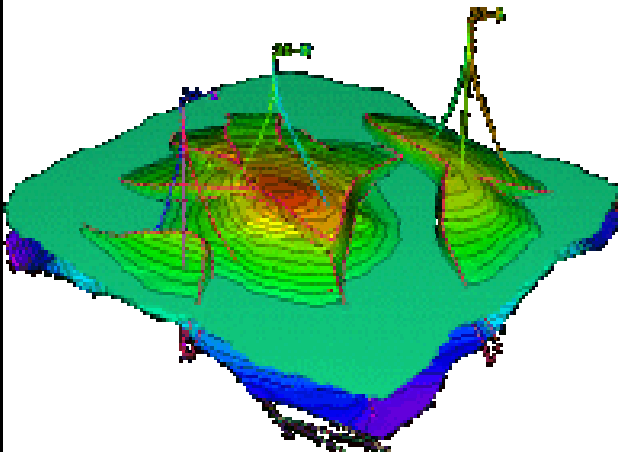
DW 1603 c – Hydrate Plugging Risk; Tulsa University

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

Contractor: Knowledge Reservoir

Budget: \$ 2,000,000

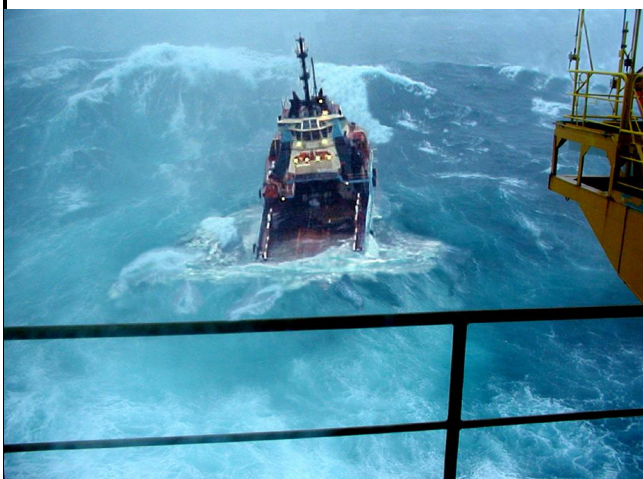
RPSEA: \$ 1,600,000



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)

Contractor: UCAR

Budget: \$ 700,000
Secure Energy for America

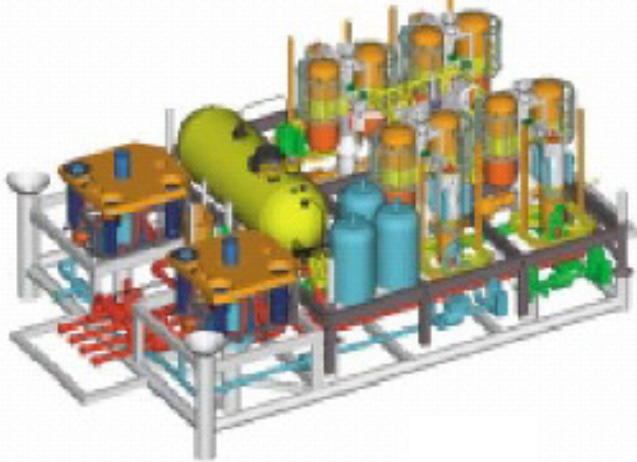
RPSEA: \$ 560,000



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)

Contractor: GE →

Budget: \$ 1,500,000

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)

Contractor: HARC →

Budget: \$ 600,000

RPSEA: \$ 480,000

