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• **Research**
• **Partnership to**
• **Secure Energy**
• **for America**
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RPSEA Ultra-Deepwater Program
Christopher Haver
Sugar Land, TX
August 29, 2007

Secure Energy for America



Contents

- What is DeepStar?
- EPACT Subpart J – UDW Focus
- RPSEA UDW Process
- UDW 2007 RFPs



Significant Contributions Since 1992

DeepStar is a collaborative industry led forum focused on:

- Enhancing existing deepwater technologies.
- Developing new enabling deepwater technologies.
- Gaining the acceptance of deepwater technologies by regulators and industry.
- Providing a forum and a process for discussion, guidance and feedback with contractors, vendors, operators, regulators and academia, regarding deepwater production system technology.





RPSEA UDW Structure PAC and TACs

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

Program Advisory Committee
“The PAC”

Regulatory TAC (X100)
51 Active Members

Flow Assurance TAC (X200)
100 Active Members

Subsea Systems TAC (X300)
138 Active Members

Floating Systems TAC (X400)
150 Active Members

Drilling & Completions TAC (X500)
66 Active Members

Reservoir Engineering TAC (X700)
44 Active Members

Met Ocean TAC (X800)
55 Active Members

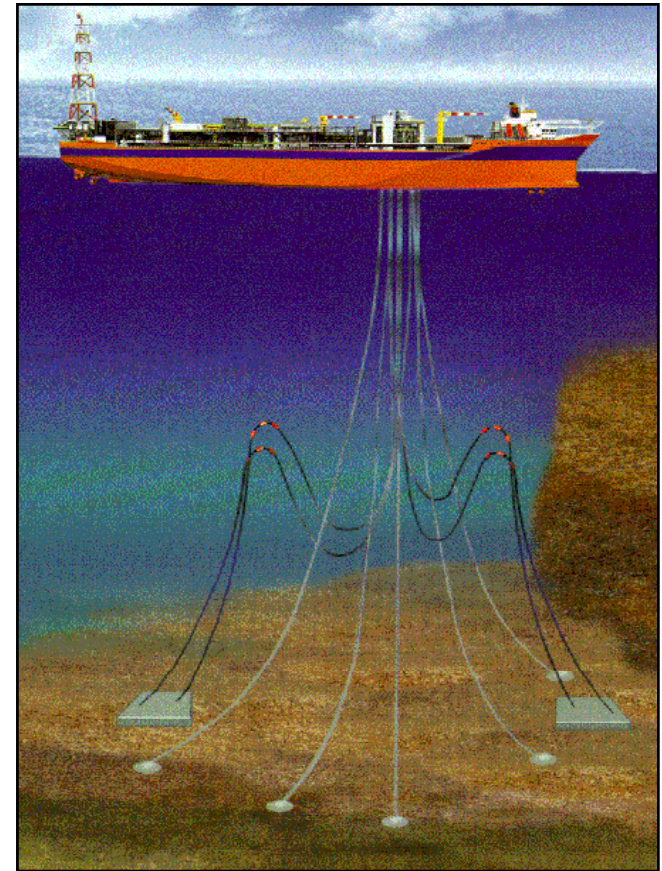
Systems Engineering TAC (X900)
76 Active Members

Geoscience TAC (X000)
15 Active Members



“Focused”

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.





We Can Make a Difference

MMS estimates there is more than 50 billion recoverable BOE remaining to be discovered in the GOM in deep and ultra-deepwater (2000).

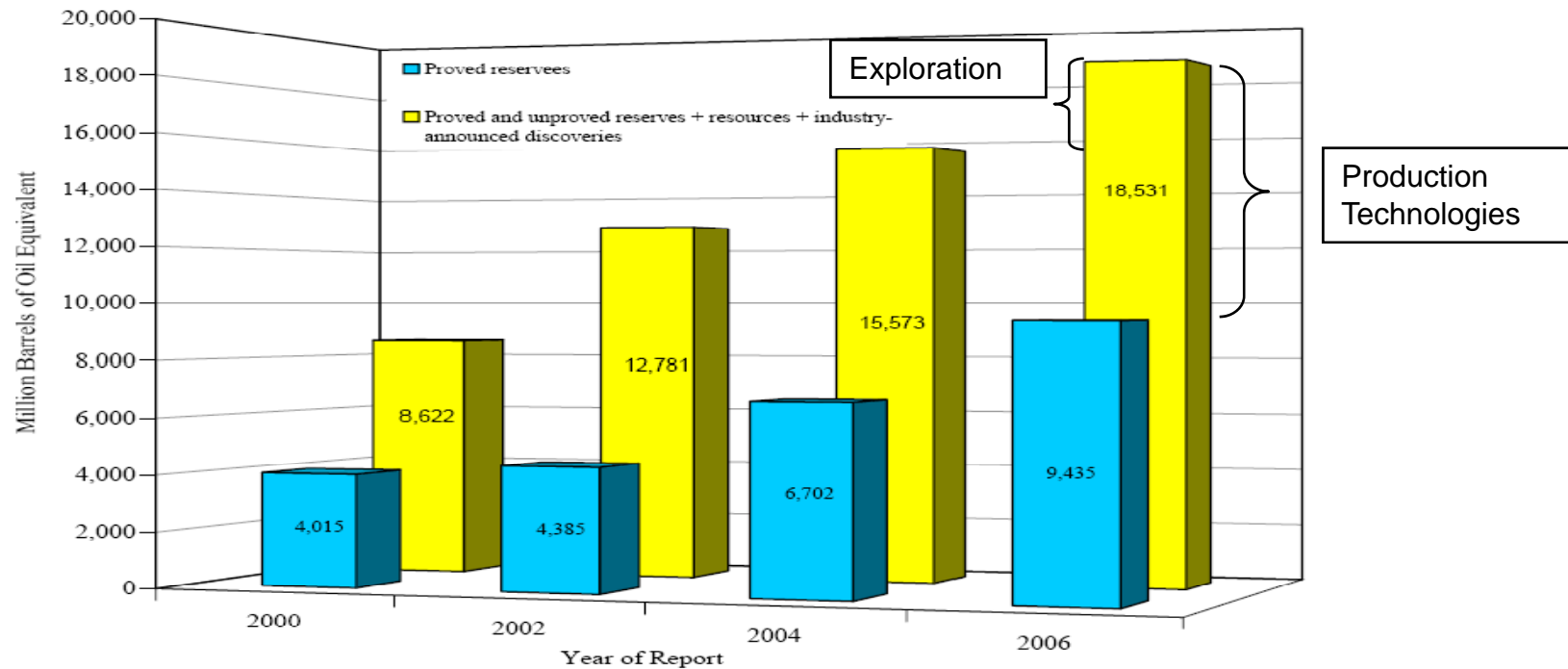
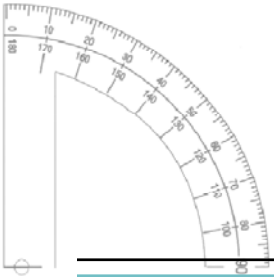
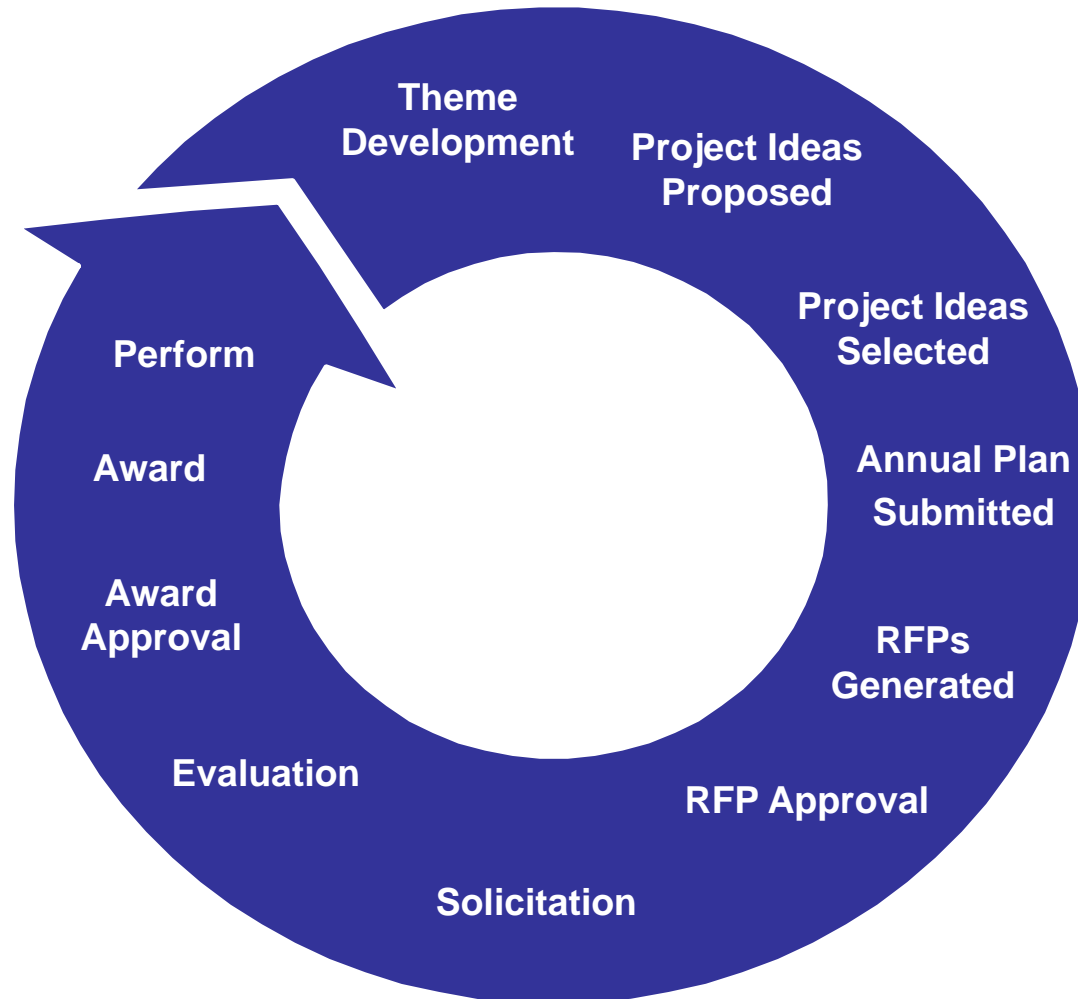
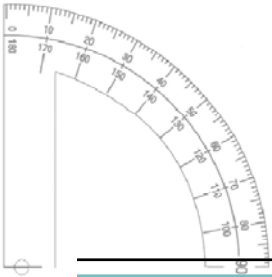


Figure 78. Comparison of 2000, 2002, 2004, and 2006 deepwater GOM reports: successive increases in deepwater BOE.



UDW Process Treadmill

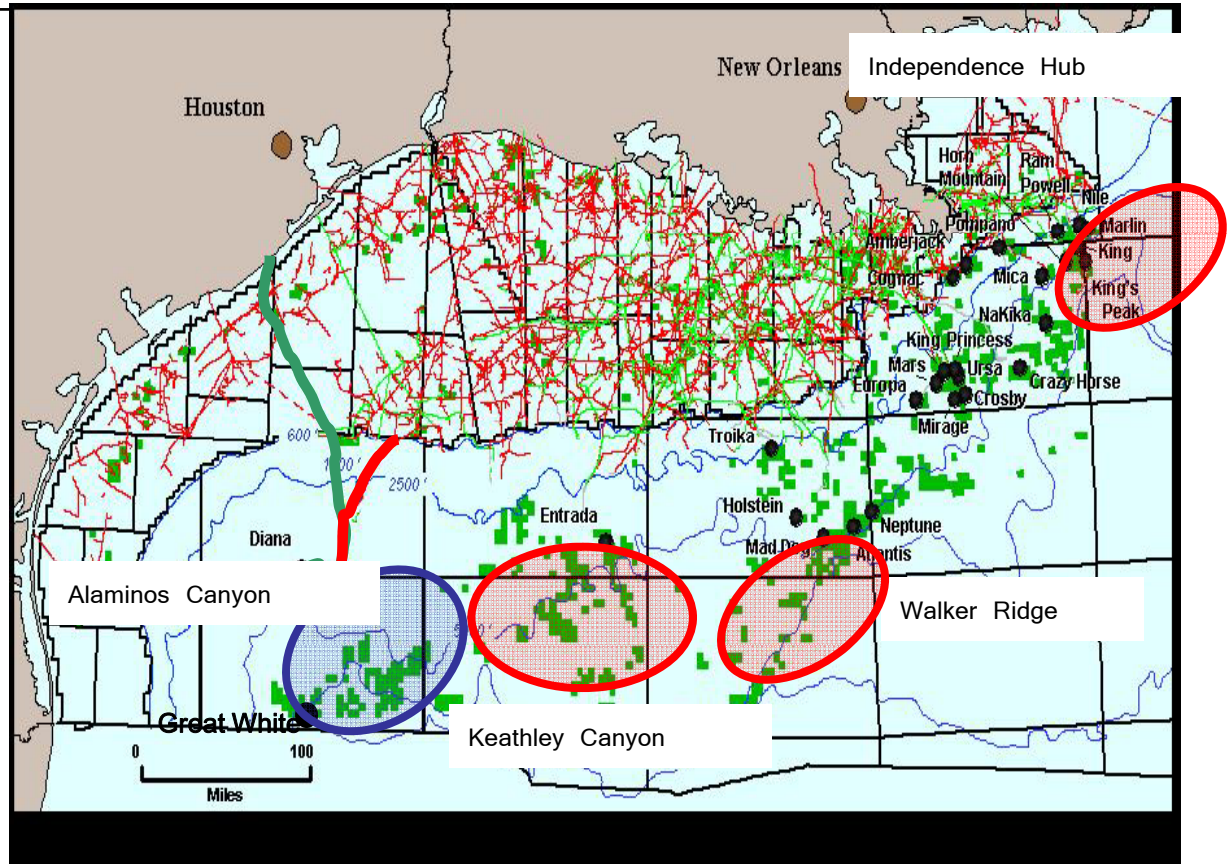


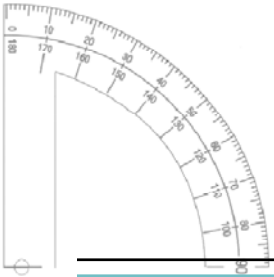


RPSEA UDW Focus Area GOM

Deepwater Trends

- **Walker Ridge /Keathley Canyon**
 - Sub-salt
 - Deeper wells
 - Tight formations
 - **Alaminos Canyon**
 - Viscous crude
 - Lacking infrastructure
 - **Eastern Gulf – Gas Independence Hub**
 - Higher pressure
 - Higher Temperature
 - CO₂ / H₂S
- Higher Drilling Costs**
Challenging Economics





Significant Demand for UDW Technology Funding

April, 2007

120+ Project Ideas
\$300 MM

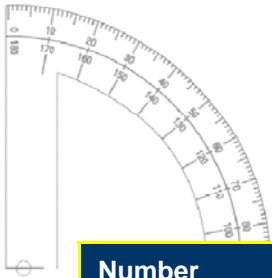
June, 2007

70 Project Ideas
\$175 MM

July, 2007

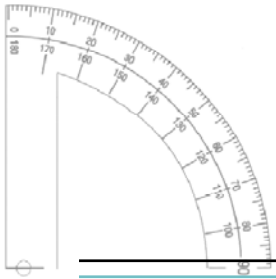
26 Project Ideas
\$30 MM

RPSEA 2007 & 2008 Projects

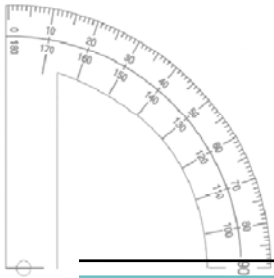


2007 UDW Projects

Number	Impact
DW 1201	Wax Control
DW 1202	EOS improvement for xHPHT
DW 1301	Multiphase Meter Technology : Improvements to Deepwater Subsea Measurement
DW 1302	Ultra-high Conductivity Umbilicals
DW 1401	Carbon Fiber Wrapped High Pressure Drilling and Production Riser Qualification Program
DW 1402	Ultra-deepwater Dry Tree System for Drilling and Production in GOM, Phase 1
DW 1403	Fatigue Performance of High Strength Riser Materials
DW 1501	Grand Challenge – Extreme Reach Development
DW 1502	Coil Tubing Drilling and Intervention System Using Cost Effective Vessels
DW 1601	RPSEA Base Case Design Criteria
DW 1603	Graduate Student Design Projects
DW 1604	Small Business Initiative (Seed Money)
DW 1701	Improved Recovery
DW 1801	Effect of Global Warming on Hurricane Activity
DW 1901	Subsea Processing System Integration Engineering
DW 1902	Deep Sea Hybrid Power System (Phase 1)

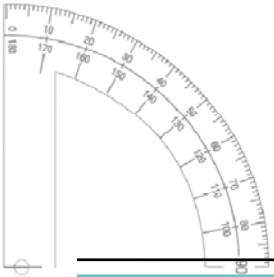


Questions



Themes

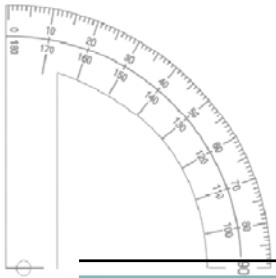
Field / Resource Area	Technology Challenge	Themes
Canopy Field	Low permeability reservoir	Completion of long reservoir sections Deep reservoir stimulation technology Formation Integrity at Commercial Production Conditions (fluid rates, differential pressures)
Gumout Field	High Viscosity Oil	Intervention strategies and well architecture for downhole equipment maintenance (pumps for example) + viscous oil technologies
Coyote Field	Small Reserve Fields	Drilling with small margin between overburden and fracture pressure (dual density drilling is a potential solution for this issue)
Diablo Field	XHPHT (22.5 ksi x 350+°F) Sour service	Optimized UDW Field Development Concepts for Improved Economics Materials Sciences for UDW Risers and Moorings, tubulars, tools, instrumentation, and completion equipment Improved Design and Analysis Methods Mooring and Riser Integrity Management + HPHT Flow Assurance
Crosscutting	Environmental	Safety Barrier Testing and Validation Criteria Environmental and Regulatory Impact of Emerging Technologies UDW Produced Water Management
	Economics	Optimized UDW Field Development Concepts for Improved Economics Materials Sciences for UDW Risers and Moorings Improved Design and Analysis Methods Mooring and Riser Integrity Management Flow Assurance Geoscience (Subsalt Imaging, Reservoir & Fluid Charac
	Metocean	Effect of changing weather patterns on hurricane severity Operational 3-D current forecast model capable of simulating the Loop/eddies Modeling for strong near-bottom currents along the Sigsbee Escarpment
	Reservoir	Appraisal Field development Production and Reservoir Surveillance
	Subsea Facilities	Subsea Production Equipment Enhancements Mature Subsea Processing Technology Pipeline, Flowline and Umbilical Technology Subsea Well Intervention Technology improvement
	Systems Engineering and Architecture	Design Criteria for the Base Cases. System impact of proposed technologies on the field development scenarios. Grand Challenge projects Small Business Initiatives



RPSEA UDW Objectives

1. Increase the supply of UDW Oil and Gas resources,
2. Reducing the costs to find, develop and produce such resources,
3. Increasing the efficiency of exploration for such resources,
4. Increasing production efficiency and ultimate recovery of such resources,
5. Improving safety, and
6. Improving environmental performance, by reducing any environmental impacts associated with UDW exploration and production.

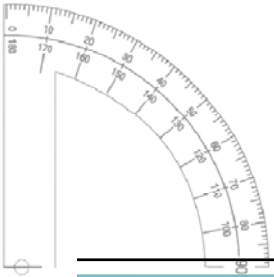




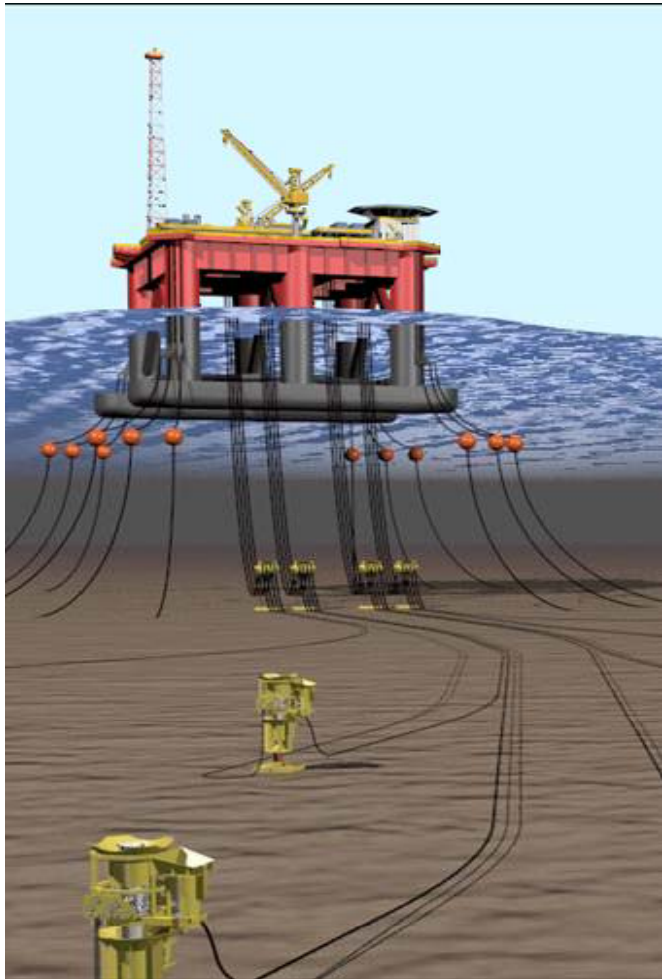
Deepwater versus Ultra-Deepwater

- **DEEPWATER.**—The term “deepwater” means a water depth that is greater than 200 but less than 1,500 meters.
- **ULTRA-DEEPWATER.**—The term “ultra-deepwater” means a water depth that is equal to or greater than 1,500 meters.





Technology Focus



- **ULTRA-DEEPWATER ARCHITECTURE.**—The term “ultra-deepwater architecture” means the integration of technologies for the exploration for, or production of, natural gas or other petroleum resources located at ultra-deepwater depths.
- **ULTRA-DEEPWATER TECHNOLOGY.**—The term “ultra-deepwater technology” means a discrete technology that is specially suited to address one or more challenges associated with the exploration for, or production of, natural gas or other petroleum resources located at ultra-deepwater depths.
- Also includes: drilling to formations in the Outer Continental Shelf to depths greater than 15,000 feet.



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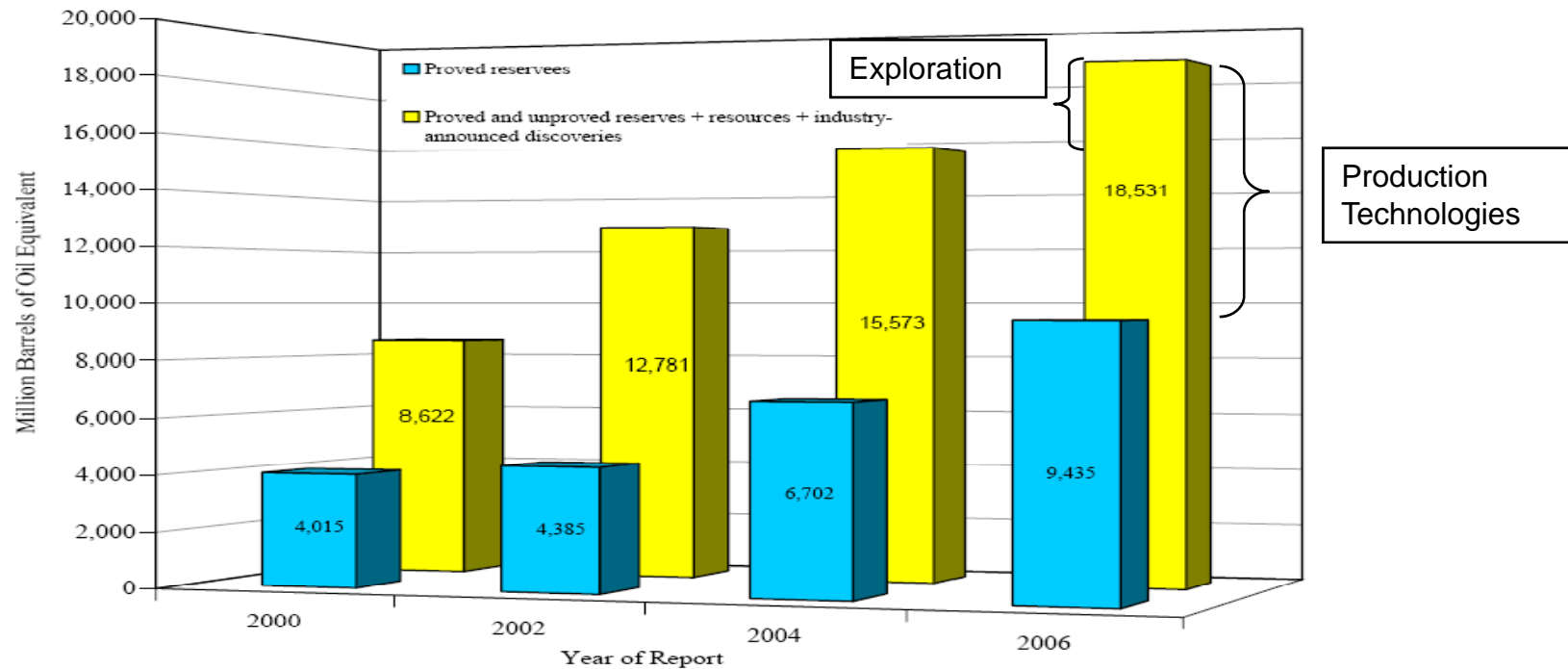
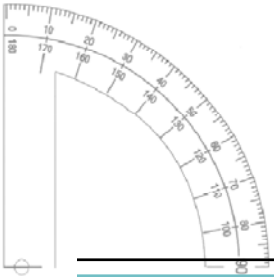
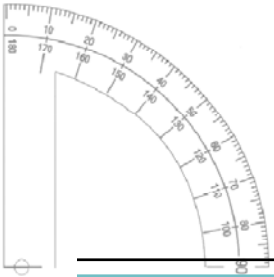


Figure 78. Comparison of 2000, 2002, 2004, and 2006 deepwater GOM reports: successive increases in deepwater BOE.



Draft Annual Plan Input

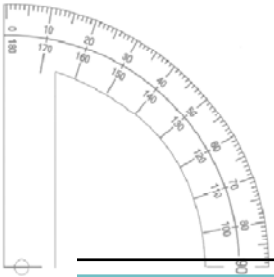
Event Type	Location	Date	Description
Roadmap session	Houston, Tx. (Tx. A&M & RPSEA)	Oct05	Ultra-Deepwater Technology Roadmap Workshop; led by Tx. A&M, 100+ participants, 6 break-out sessions and final report
RPSEA Forums	Cambridge, MA. (MIT)	Oct06	Autonomous Intervention for Deepwater O&G Operations Forum
	Los Angeles, CA (USC)	Nov06	Ultra-deepwater Resources
	Houston, TX. (MIT & Chevron)	Jan07	Vortex Induced Vibrations Forum
	Tulsa, OK (University of Tulsa & Halliburton)	Feb07	Flow Assurance
RPSEA Advisory workshops	Houston, TX.	Oct06- Feb07	Technical Advisory Committees; numerous over this timeframe including hundreds of experts
Other	NPC study	Nov06	Draft Technical Section information
	RPSEA PAC & DeepStar Systems Engineering		Identification of Technology Needs study; 7902 report



UDW Base Cases

- 4 deepwater Reservoir Base Cases focus work.
 - Canopy – (Subsalt; low perm)
 - Coyote – (Low energy reservoir)
 - Gumout – (Viscous Production)
 - Diablo (XHPHT Field)





Off and Running!

