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• **Research**  
• **Partnership to**  
• **Secure Energy**  
• **for America**  
•

**2009 International  
Coalbed & Shale Gas  
Symposium**

**C. Michael Ming  
University of Alabama  
Tuscaloosa, AL  
May 20, 2009**

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**SECURE ENERGY FOR AMERICA**

# The Energy Policy Act of 2005 And Section 999:

A Industry led Public/Private Partnership for R&D in the Ultra-Deepwater in the Gulf of Mexico and in Unconventional Onshore Natural Gas and Other Petroleum Resources of the United States.

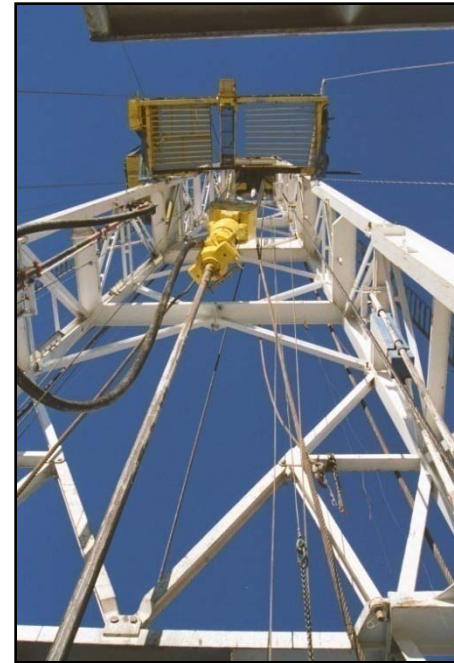


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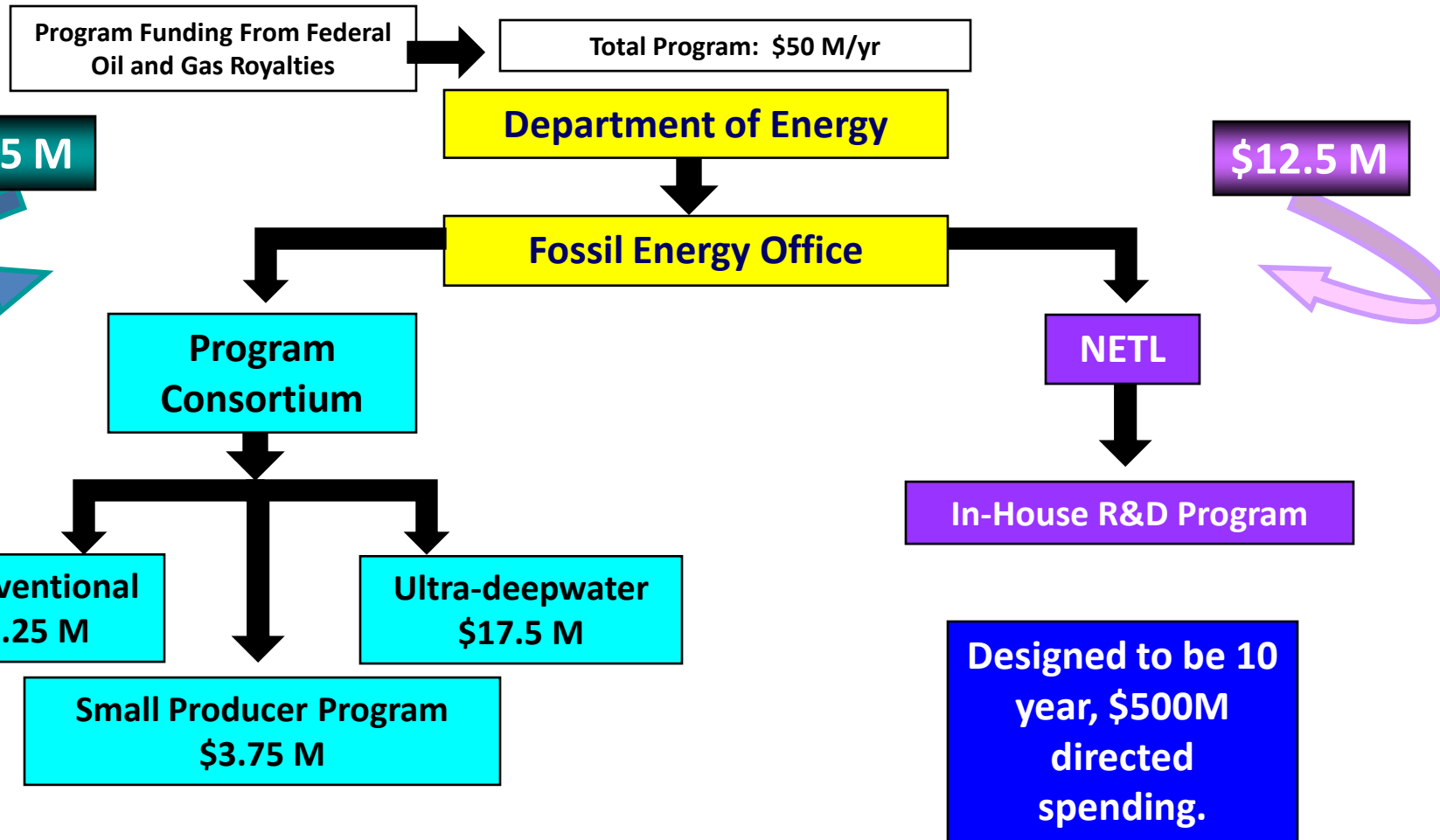
# What is Section 999?

## Specifically, the law directs --

- Research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resource
- Maximize the U.S resource value by:
  - Increasing supply
  - Reducing the cost
  - Increasing E&P efficiency
  - Improving safety and minimizing environmental impacts



# Current Program Structure/Funding



# Unconventional Onshore Themes

## ■ Gas Shales

- Rock properties/Formation Evaluation
- Fluid flow and storage
- Stimulation
- Water management

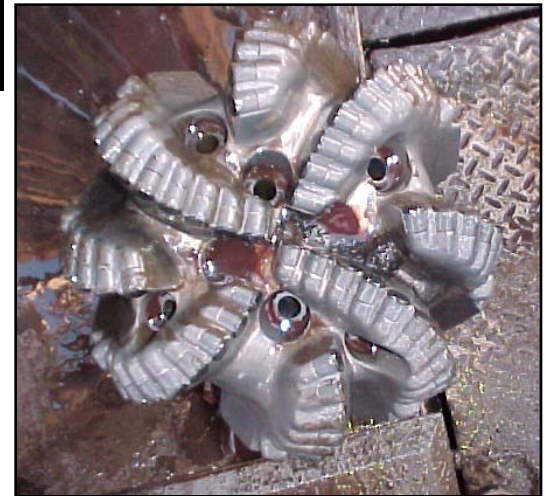
## ■ Coalbed Methane

- Produced water management

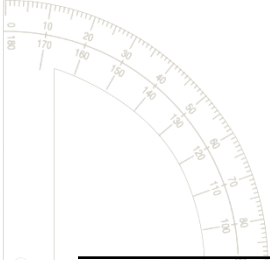
## ■ Tight Sands

- Natural fractures
- Sweet spots
- Formation Evaluation
- Wellbore-reservoir connectivity
- Surface footprint

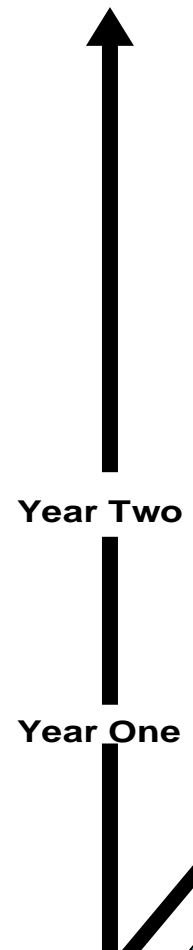
**Cost Reduction  
in All Aspects of  
Operations**



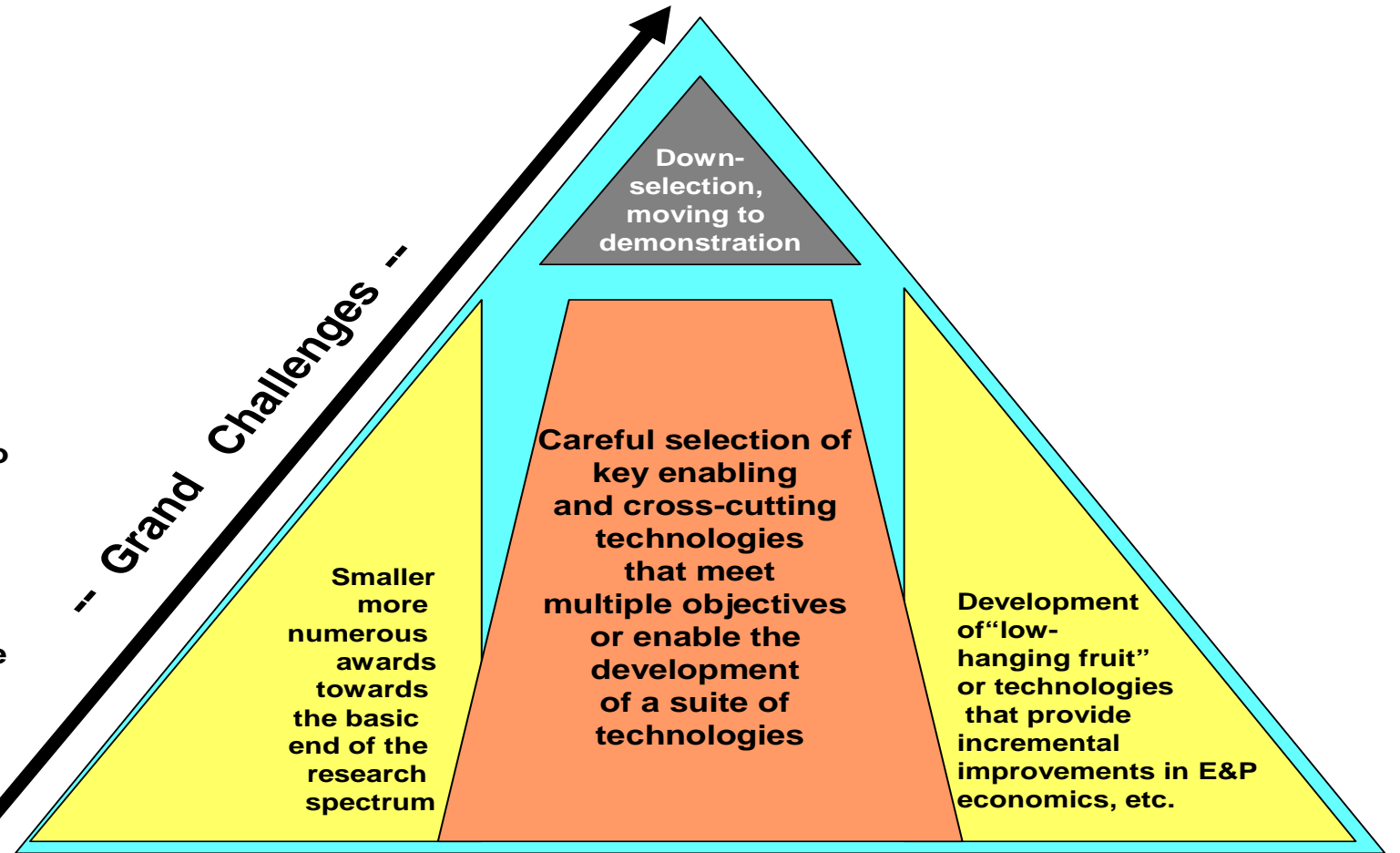
# Building a Relevant Portfolio



Years Five  
thru Ten



-- Grand Challenges --



Down-selection,  
moving to  
demonstration

Smaller  
more  
numerous  
awards  
towards  
the basic  
end of the  
research  
spectrum

Careful selection of  
key enabling  
and cross-cutting  
technologies  
that meet  
multiple objectives  
or enable the  
development  
of a suite of  
technologies

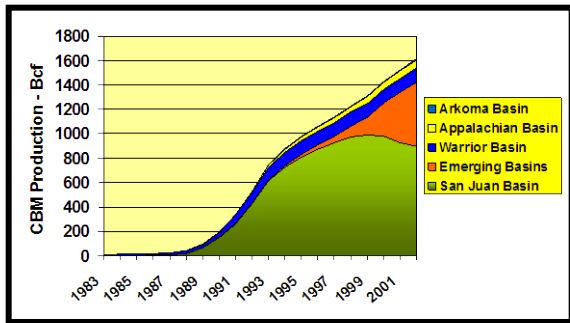
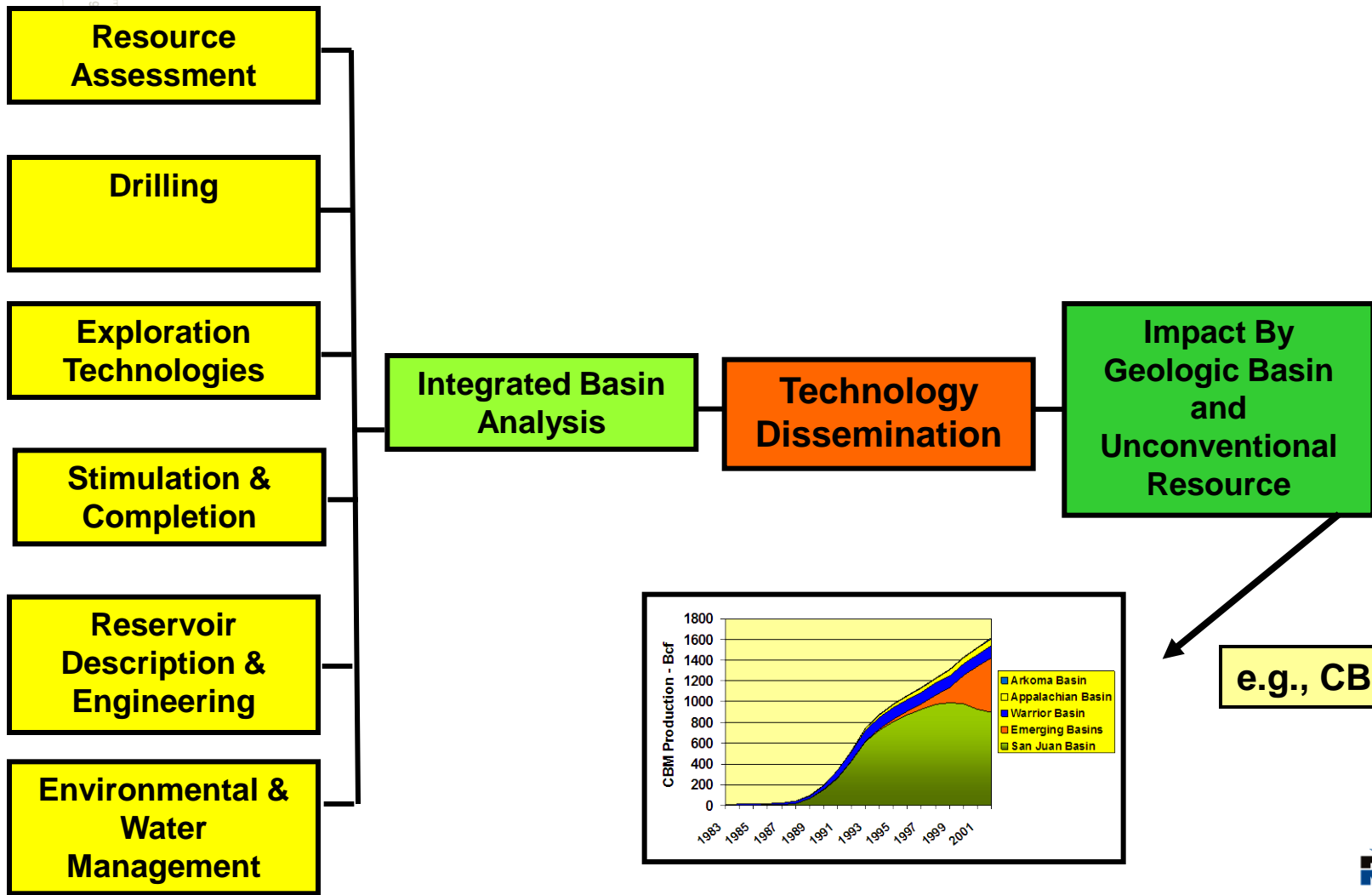
Development  
of "low-  
hanging fruit"  
or technologies  
that provide  
incremental  
improvements in E&P  
economics, etc.

Science Themes

Enabling/Cross-cutting Themes

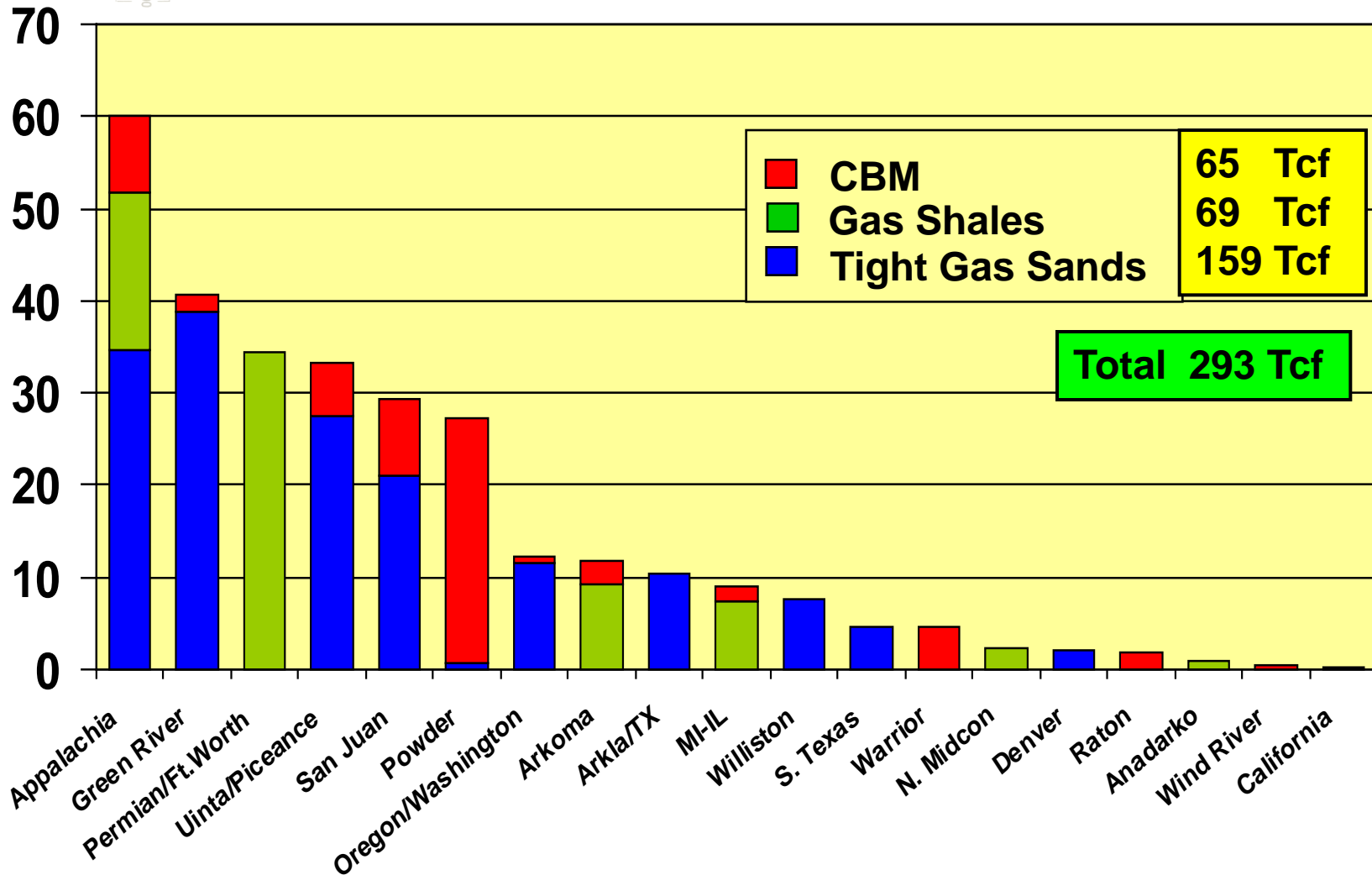
Enhancing Themes

# RPSEA Unconventional Gas Program Components & Approach



e.g., CBM

# Technically Recoverable Unconventional Gas (Tcf) By Geologic Basin



	CBM 10%	Gas Shales 45%	Tight Sands 45%
<b>Integrated Basin Analysis</b>		\$3.4M (GTI) New Albany	\$2.9M(CSM) - Piceance
<b>Drilling</b>			
<b>Stimulation and Completion</b>	\$.08M (Penn St.) Microwave CBM	\$.09M - Carter -Cutters \$.69M (U.Houston) \$.95M UT-Refrac ★	\$1.05M (TEES) Gel Damage \$.22M (Tulsa) Frac Damage
<b>Water Management</b>	\$1.56M (CSM) Intergrated Treatment Framework	★	★
<b>Environmental</b>	★	★	★
<b>Reservoir Description &amp; Management</b>		\$1.07M (LBNL) High Resolution Imaging ★	\$1.7M (LBNL) Expert Teaching System Tgas ★
<b>Reservoir Engineering</b>		\$.31M (TEES) Dev. Strategy/Decision Model ★	\$.44M (Tulsa) Wamsutter \$1.07M (UofUtah) Forecasting TGas \$.52M (Stanford) Condensate
<b>Resource Assessment</b>		\$.50M (Geo Surv)Alabama Shales \$.43M (Utah Geo)Manning Shales	\$.67M (CSM) Gas Comp. Rockies
<b>Exploration Technologies</b>	\$.86M (CSM) Coal &Bugs	★	★

<b>H</b>
<b>M</b>
<b>L</b>

High Priority

Medium Priority

Low Priority

Resource Focus

Technology Focus

**Current Portfolio**

	CBM 10%	Gas Shales 45%	Tight Sands 45%	
<b>Integrated Basin Analysis</b>		New Albany (GTI) \$3.4	Piceance (CSM) \$2.9	\$6.3
<b>Drilling</b>				\$0.0
<b>Stimulation and Completion</b>	Microwave CBM (Penn) \$.08	Cutters (Carter) \$.09 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95 <u>Frac Cond (TEES) \$1.6</u>	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22	\$4.7
<b>Water Management</b>	Integrated Treatment Framework (CSM) \$1.56	<u>Barnett &amp; Appalachian (GTI)</u> <u>\$2.5</u>	<u>Frac Water Reuse (GE) \$1.1</u>	\$5.2
<b>Environmental</b>	*	<u>Environmentally Friendly Drilling (HARC)* \$2.2</u>	*	\$2.2
<b>Reservoir Description &amp; Management</b>		Hi Res. Imag. (LBNL) \$1.1 <u>Gas Isotope (Caltech) \$1.2</u> <u>Marcellus Nat. Frac./Stress (BEG) \$1.0</u>	Tight Gas Exp. System (LBNL) \$1.7 <u>Strat. Controls on Perm. (CSM) \$0.1</u>	\$5.1
<b>Reservoir Engineering</b>		Decision Model (TEES) \$.31 <u>Coupled Analysis (LBNL) \$2.9</u>	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52	\$5.3
<b>Resource Assessment</b>		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67	\$1.6
<b>Exploration Technologies</b>	Coal & Bugs (CSM) \$.86	<u>Multi-Azimuth Seismic (BEG)</u> <u>\$1.1</u>		\$2.0

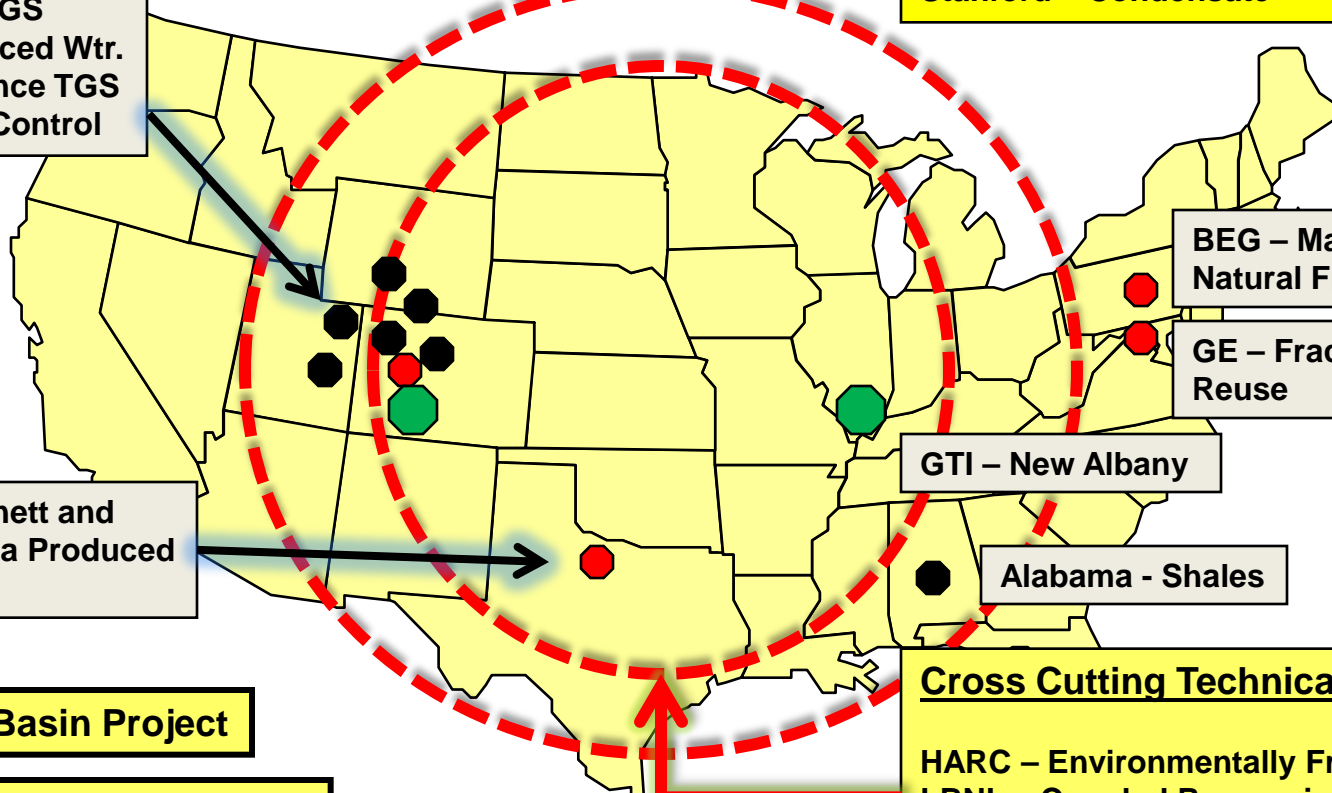
<b>2008 Program Priorities</b>	\$2.5	\$20.0	\$9.8	\$32.3
	<b>H</b>	High Priority	<b>2007 Projects</b>	
	<b>M</b>	Medium Priority	<u><b>2008 Projects</b></u>	
	<b>L</b>	Low Priority		

# RPSEA Unconventional Gas Projects

## Cross Cutting Technical Projects

UH – Fracturing (UT)  
 LBNL – Self Teaching Expert System  
 UT – Refracturing  
 TEES – Fracturing Gels  
 LBNL – High Resolution Imaging  
 PSU – Microwave Coals  
 Carter – Saws  
 Tulsa – Novel Fracturing Fluids  
 Stanford – Condensate

CSM - Coal Bugs  
 Utah - Paleo Shales  
 Tulsa – Wamsutter  
 CSM – Gas Quality  
 U of Utah – TGS  
 CSM – Produced Wtr.  
 CSM – Piceance TGS  
 CSM – Strat Control



BEG – Marcellus Natural Fractures

GE – Frac Water Reuse

GTI – New Albany

Alabama - Shales

GTI – Barnett and Appalachia Produced Water

## Cross Cutting Technical Projects

HARC – Environmentally Friendly Drilling  
 LBNL – Coupled Reservoir Model  
 TEES – Fracture Conductivity  
 BEG – Multi – Azimuth Seismic  
 CalTech – Gas Isotopes

**Integrated Basin Project**

**Technical/Resource Projects**

Significant Producer and Service Industry Involvement

# - Crucial for Program Relevancy

- Anadarko
- Chevron
- Pioneer Natural Gas
- Williams E&P
- ConocoPhillips
- ExxonMobil
- Newfield Exploration
- Encana
- BP
- Bill Barrett Corp.
- Pinnacle Gas Resources
- Coleman Oil & Gas
- Ciris Energy

- Devon Energy
- Unconventional Gas Resources Canada
- Whiting Petroleum
- CNX Gas
- Trendwell
- Diversified Operating Corp
- Noble Energy
- Jones Energy
- Aurora Oil & Gas

- Schlumberger
- Halliburton
- Pinnacle Technologies
- BJ Services
- Carbo Ceramics



# The Technology Challenges of Small Producers

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## Focus Area – Advancing Technology for Mature Fields

### ■ Target – Existing/Mature Oil & Gas Accumulations

- Maximize the value of small producers' existing asset base
- Leverage existing infrastructure
- Return to production of older assets
- Minimal additional surface impact
- Minimize and reduce the existing environmental impact
- Lower cost and maximize production

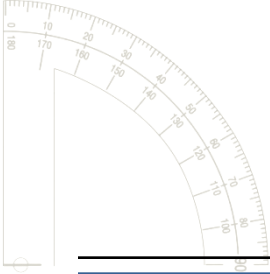




# Award Composition - 2007 Program

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	Small Producer	On Shore	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



# Award Value – 2007 Program

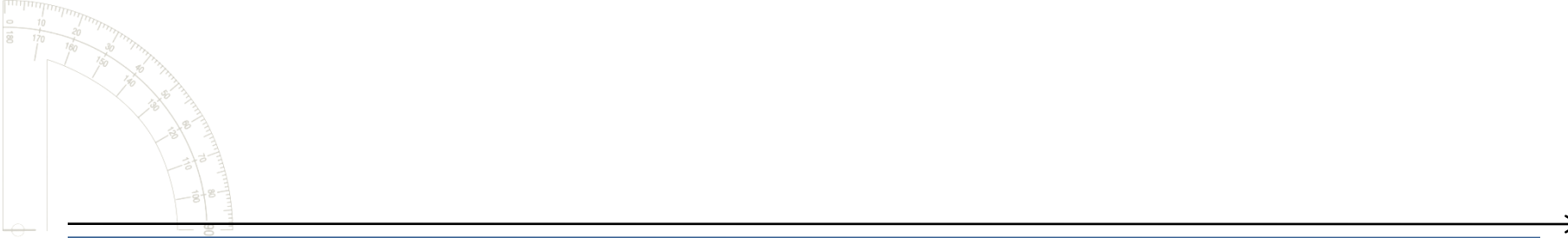
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	<b>Total Value (000)</b>	<b>RPSEA Share (000)</b>	<b>Cost Share (000)</b>	<b>Cost Share %</b>
<b>Small Producer</b>	\$ 5,334	\$ 2,981	\$ 2,353	44
<b>On Shore</b>	\$33,620	\$17,938	\$15,682	47
<b>Ultra Deepwater</b>	\$20,311	\$15,317	\$ 4,994	25
<b>Total Program</b>	\$59,265	\$36,236	\$23,029	39

# 2008 Awards

	Small Producer	On Shore	Total
Universities	4	5	9
For Profits	2	1	3
Non-Profits		2	2
National Labs		1	1
State Agencies			
<b>Total Selected</b>	<b>6</b>	<b>9</b>	<b>15</b>

	Total Value (000)	RPSEA share (000)	Cost Share (000)	Cost Share %
Small Producer	\$6,836	\$3,140	\$3,695	54
On Shore	\$17,182	\$13,746	\$6,836	40
<b>Total Program</b>	<b>\$24,019</b>	<b>\$16,886</b>	<b>\$10,532</b>	<b>44</b>



“You miss 100% of the shots  
you don’t take.”

Wayne Gretzky

[mming@rpsea.org](mailto:mming@rpsea.org)

[www.rpsea.org](http://www.rpsea.org)