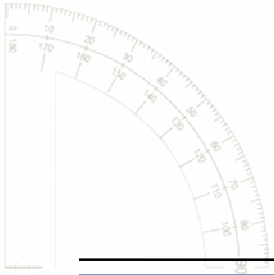


-
-
- **Research**
- **Partnership to**
- **Secure Energy**
- **for America**
-

Unconventional Onshore & Small Producer FACA Meeting

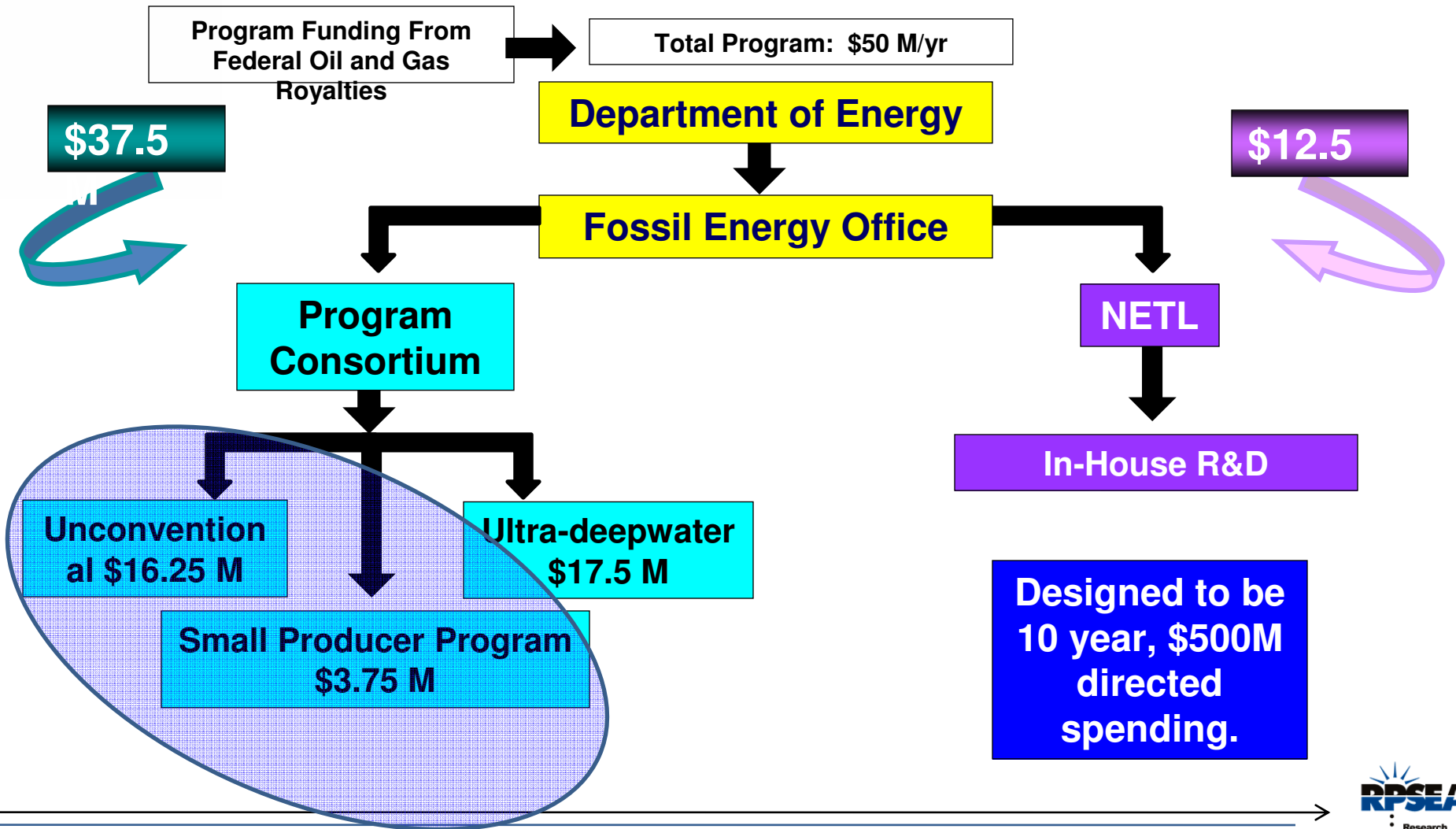
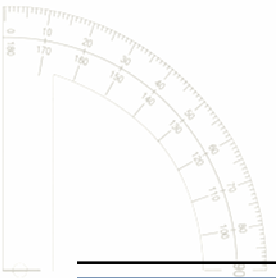
Robert W. Siegfried
September 9, 2010
Sugar Land, TX



Contents

- RPSEA Organization
- Unconventional Resources Program Element
- Small Producer Program Element
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Current Program Structure/Funding



Alaska
University of Alaska Fairbanks

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

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

Connecticut
APS Technology, Inc

Idaho
Idaho National Laboratory
U.S. Geothermal Inc

Illinois
Gas Technology Institute

Kansas
The University of Kansas

Kentucky
Greensburg Oil, LLC
NGAS Resources, Inc

Louisiana
Louisiana State University

Maryland
Lockheed Martin Corporation

Massachusetts
Entropy Limited
Massachusetts Institute of Technology
Woods Hole Oceanographic Institution

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
Sandia National Laboratories
Sirata Production Company

New York
Hess Corporation
North Dakota
Laserfith Corporation
Western Standard Energy Corporation

Ohio
MesoCoat, Ltd
NGO Development Corporation
The Ohio State University
Wright State University

Oklahoma
Chesapeake Energy Corporation
Devon Energy Corporation
Interstate Oil and Gas Compact Commission
Oklahoma Independent Petroleum Association
MAP Royalty, Inc
Panther Energy Company, LLC
Petroleum Technology Transfer Council
The Fleischaker Companies
The University of Oklahoma
The University of Tulsa
The Williams Companies, Inc

Pennsylvania
The Pennsylvania State University
Vista Resources, Inc

Texas
Acute Technological Services, Inc
Advantek International Corp
AGR Subsea, Inc
Alcoa Oil and Gas
AMOG Consulting, Inc
Anadarko Petroleum Corporation
Apache Corporation
At Balance Americas L L C
Athens Group
Baker Hughes Incorporated
Blade Energy Partners, Ltd
BJ Services Company
BP America, Inc
BMT Scientific Marine Services Inc
Cameron/Curtiss-Wright EMD
Capstone Turbine Corporation
CARBO Ceramics, Inc
City of Sugar Land
ConocoPhillips Company
Consumer Energy Alliance
C-SI Technologies, Inc
Cubility
DeepFlex Inc
Deepwater Structures, Inc
Deepwater XLP Technology, LLP

Det Norske Veritas (USA)
Energy Valley, Inc
ExxonMobil Corporation
GE Oil & Gas
General Marine Contractors, LLC
Granherne, Inc
Greater Fort Bend Economic Development Council
GSI Environmental, Inc
Halliburton
HIMA Americas, Inc
Houston Advanced Research Center
Houston Offshore Engineering, LLC
Houston Technology Center
Intelligent Agent Corporation
Knowledge Reservoir, LLC
Konsberg Oil & Gas Technologies Inc
Lepton-Hall Group
Marathon Oil Corporation
M&H Energy Services
Merrick Systems, Inc
Nalco Company
NanoRidge Materials, Inc
National Oilwell Varco, Inc
Nautilus International, LLC
Neptec USA
Nexen Petroleum USA Inc
Oceanering International, Inc
OTM Consulting Ltd
Oxane Materials, Inc
Pertus International Inc
Petrus Technology, Inc
Petrobras America, Inc
Pioneer Natural Resources Company
QO Inc
Quanelle, LLC
Quest Offshore Resources
Rice University
Rock Solid Images
RTI Energy Systems
Schlumberger Limited
Shell International Exploration & Production
Simmons & Company International
SiteLark, LLC
Southern Methodist University
Southwest Research Institute
Statoil
Stress Engineering Services, Inc
Subsea Riser Products
Technip
Technology International
Texas Research & Engineering, LP
Tenaris
Texas A&M University
Texas Energy Center
Texas Independent Producers and Royalty Owners Association
Texas Tech University
The Research Valley Partnership, Inc
The University of Texas at Austin
Titanium Engineers, Inc
TOTAL E&P USA, Inc
Tubel Energy LLC
University of Houston

VersaMarine Engineering, LLC
Weatherford International Ltd
WFS Energy & Environment
Zobel
2H Offshore Inc

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
BlueView Technologies, Inc
Quest Integrated, Inc
Washington D.C.
Consortium for Ocean Leadership

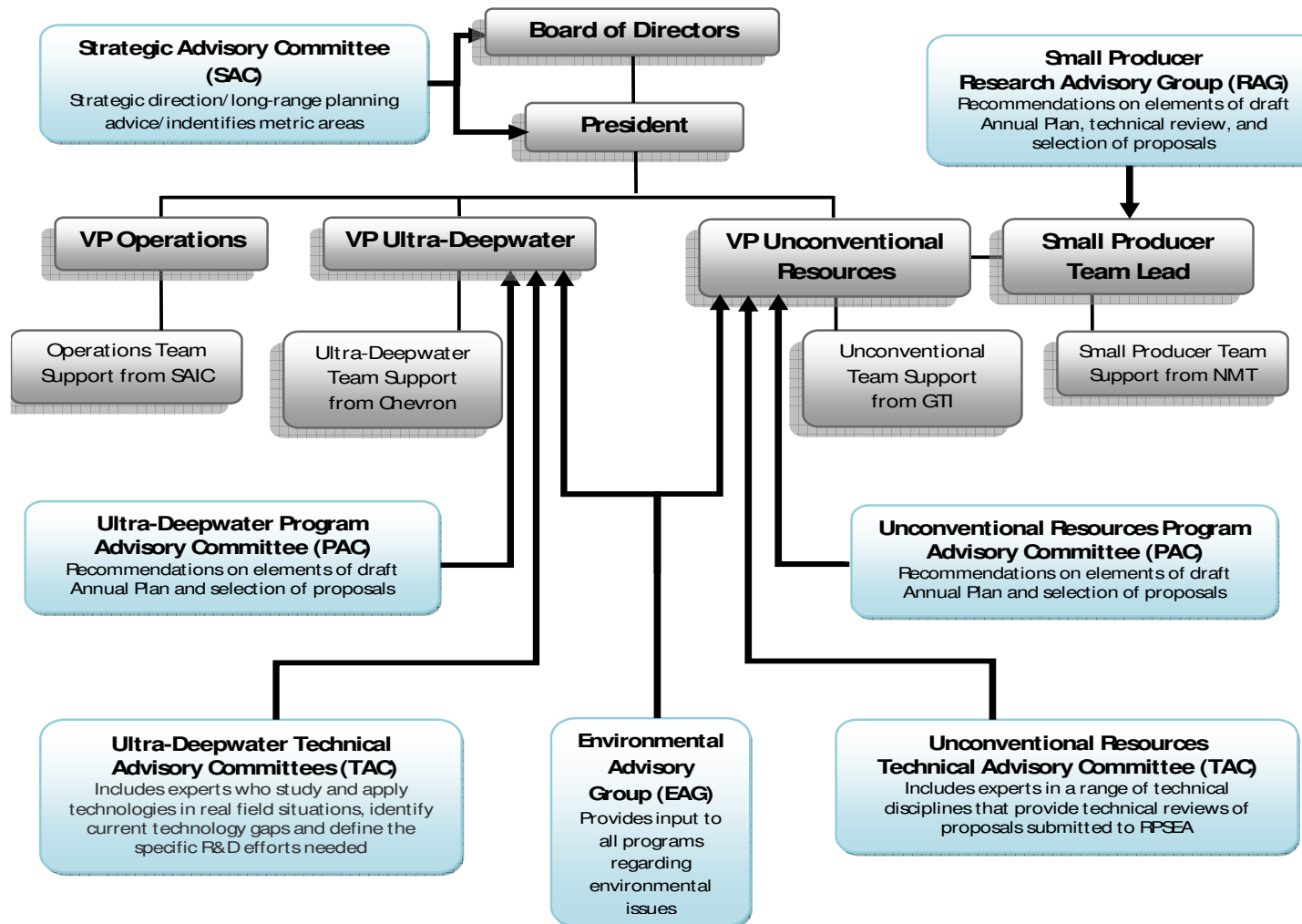
West Virginia
West Virginia University

Wyoming
Big Cat Energy Corporation
EnerCrest, Inc
Weidlog, Inc

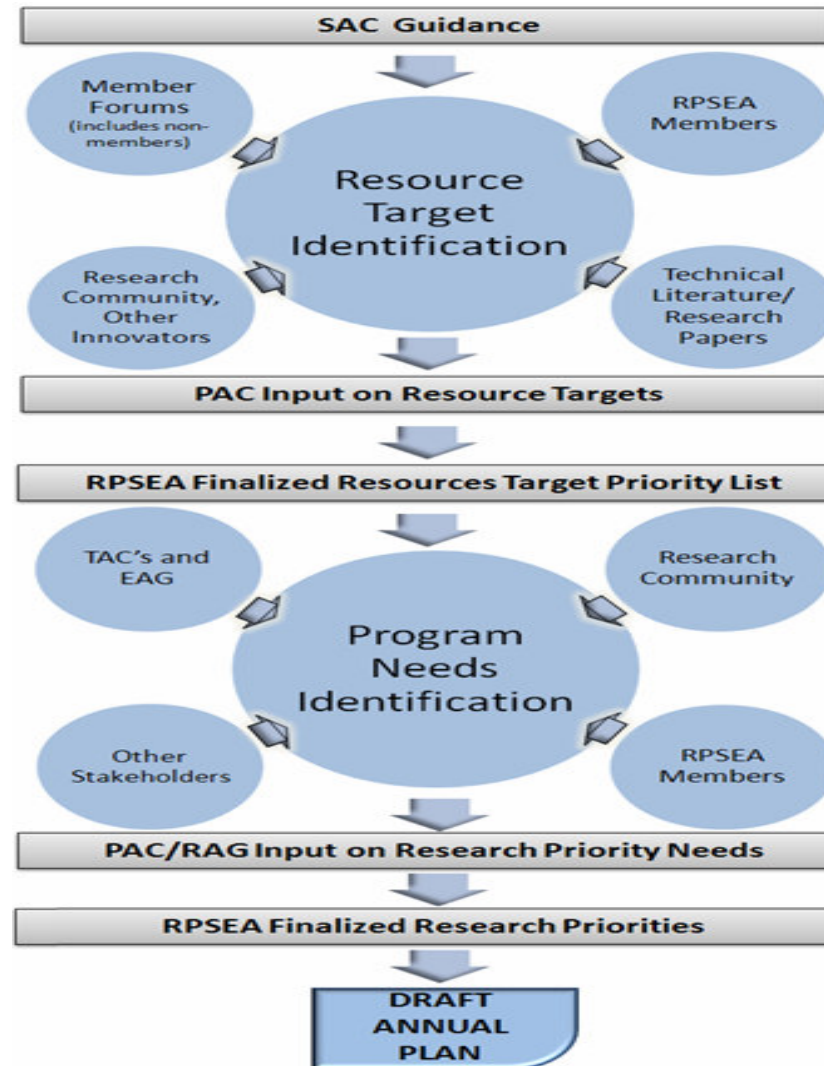
Newfoundland, Canada
Propel Inc

Pending Member - company name
in green

RPSEA Organization

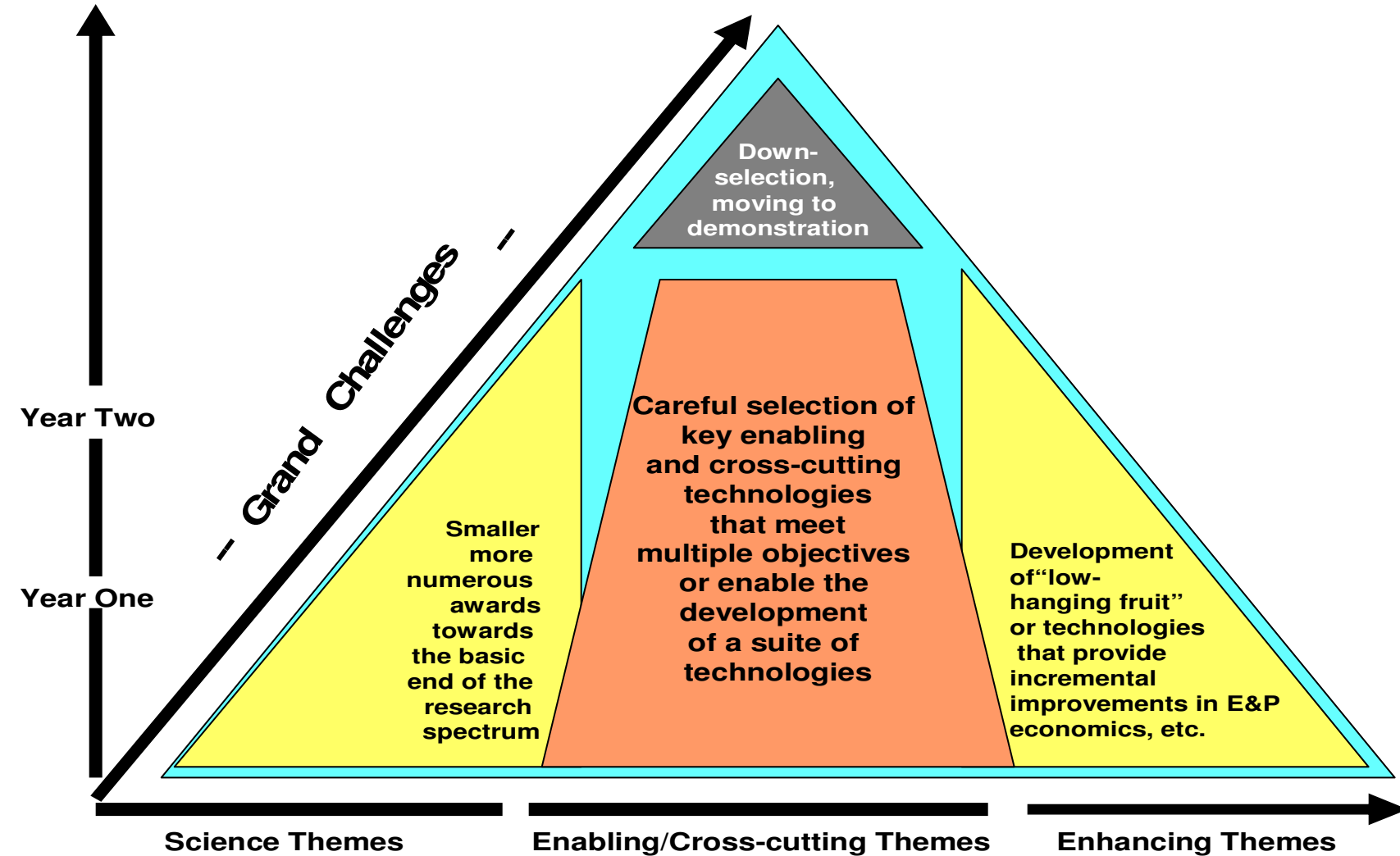


RPSEA 2010 dAP Process Flow

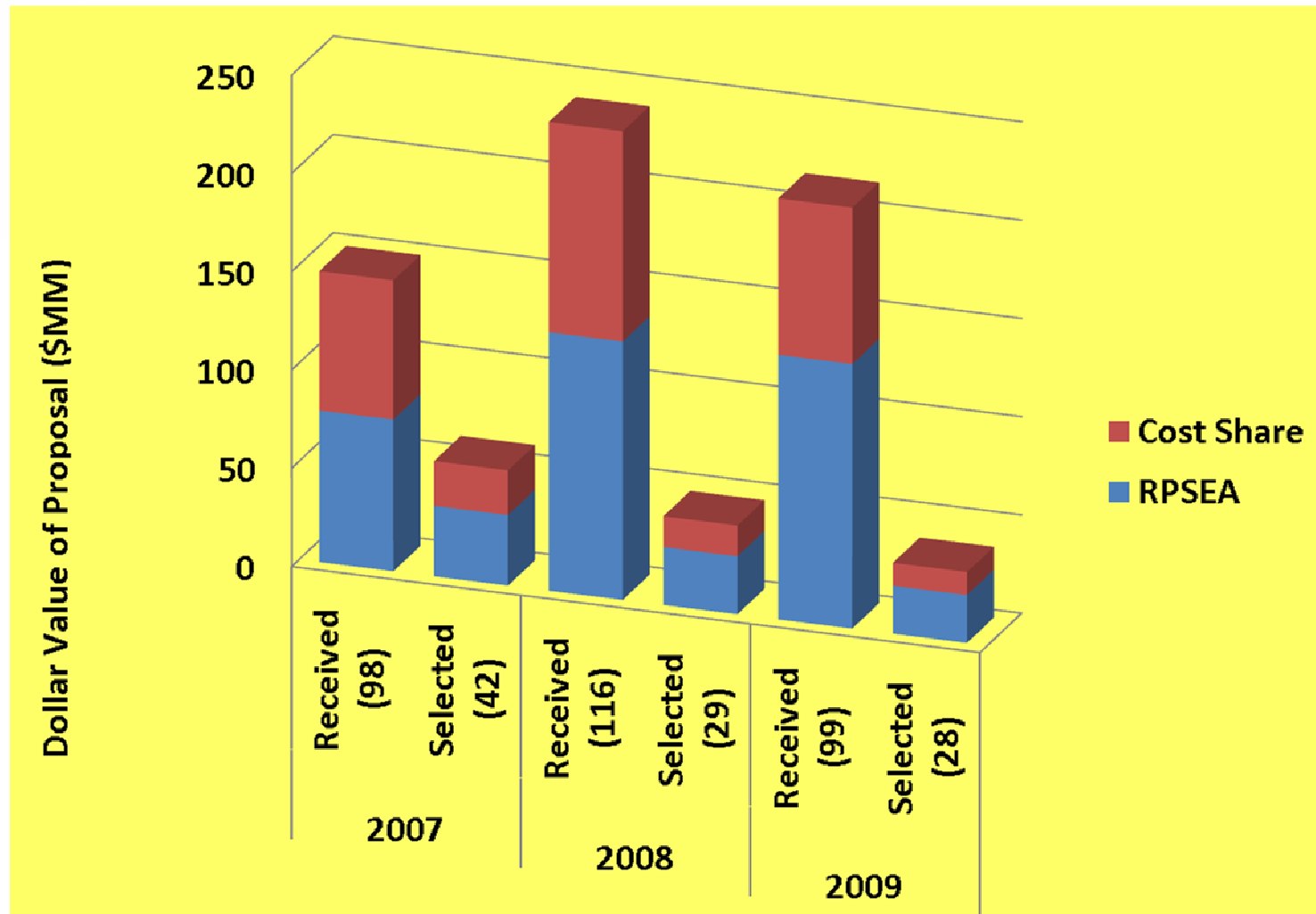


Building a Relevant Portfolio

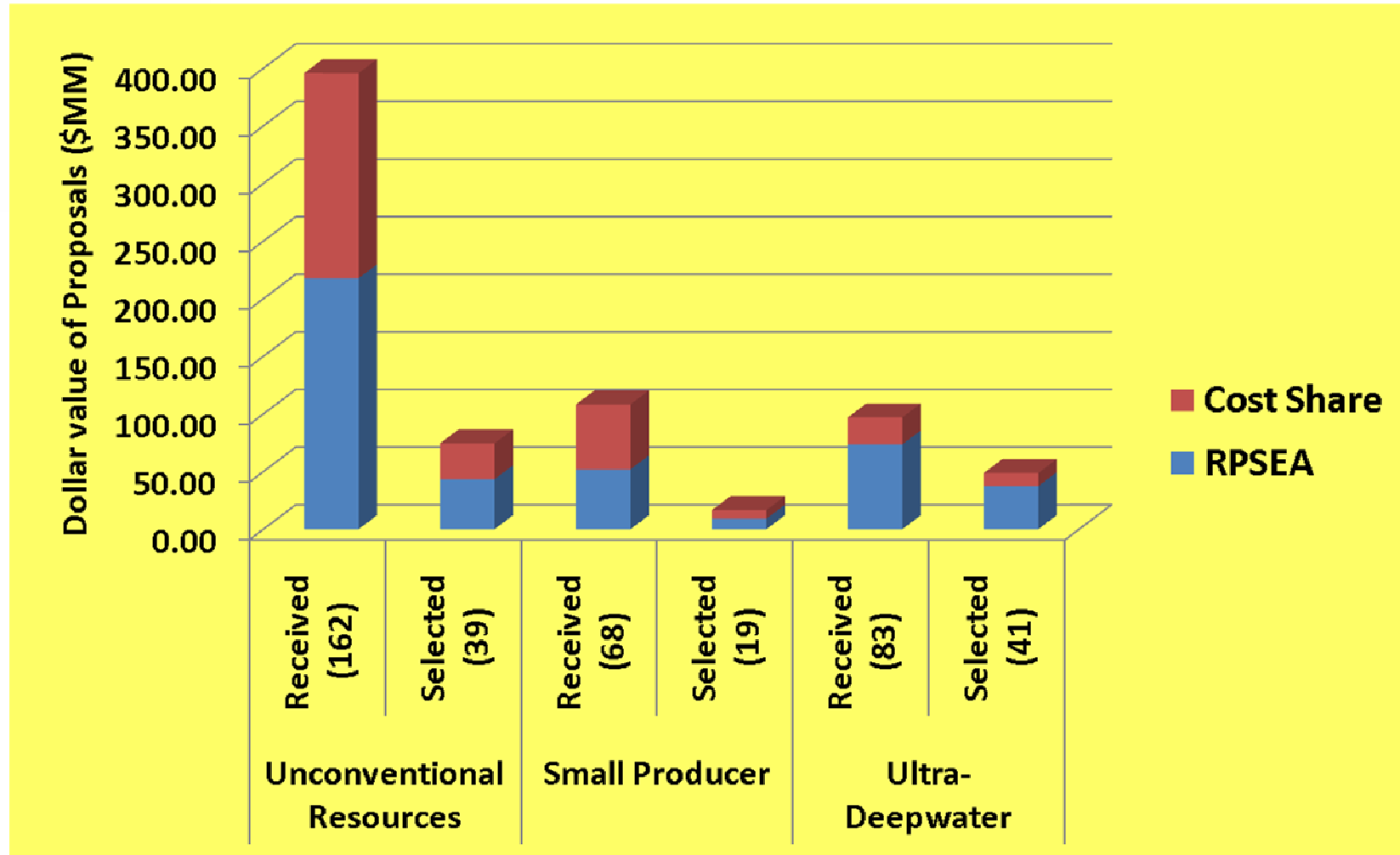
Years Five
thru Ten

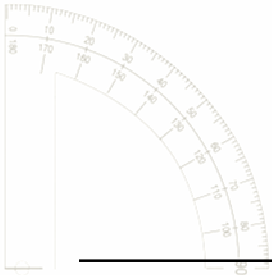


Summary of Proposals 2007-2009



2007-2009 Proposals



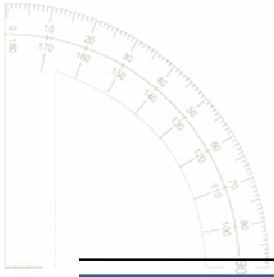


Portfolio Overview

RPSEA Program Selections 2007-2009				
	Small Producer	Unconventional Resources	Ultra-Deepwater	Total
Universities	14	25	10	49
For Profits	4	4	25	33
Non-Profits	0	4	5	9
National Labs	1	3	1	5
State Agencies	0	3	0	3
Total Selected	19	39	41	99

Secure Energy for America

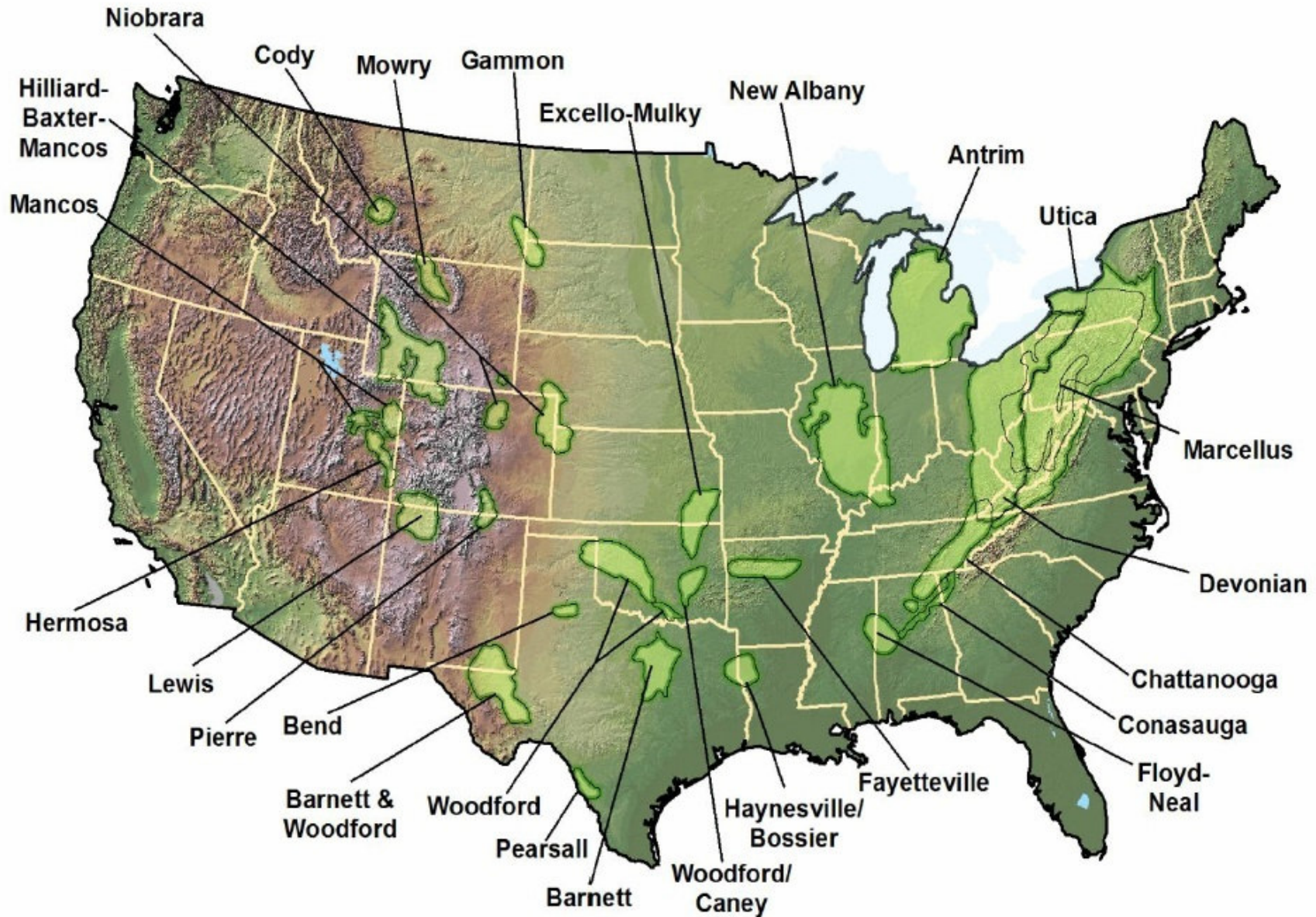




Contents

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- **Unconventional Resources Program Element**
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U.S. Unconventional Shale Gas Plays





Unconventional Gas

- **Potential to Impact National, International Energy Supply**
 - Abundant
 - Low carbon
 - Suitable for transportation and power generation
- **Technical Challenges**
 - Cost
 - Environmental impact of development
 - These challenges are closely related
 - Concern over safety and unplanned environmental impact





2011 Draft Annual Plan – Unconventional Onshore Program

- **Mission & Goal**

- Unchanged from 2007-2010
- *Economically viable* technologies to allow *environmentally acceptable* development of unconventional gas resources
 - Gas Shales
 - Tight Sands
 - Coalbed Methane

- **Objectives**

- **Near Term**
 - Increase production & recovery from established unconventional gas resources, accelerate development of existing & emerging plays
 - Decrease environmental impact of unconventional gas development
 - Integrate project results & deliverables and engage in technology transfer to ensure application of program results
- **Longer Term**

Secure Energy for America **Technologies for high-priority emerging & frontier resources**

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

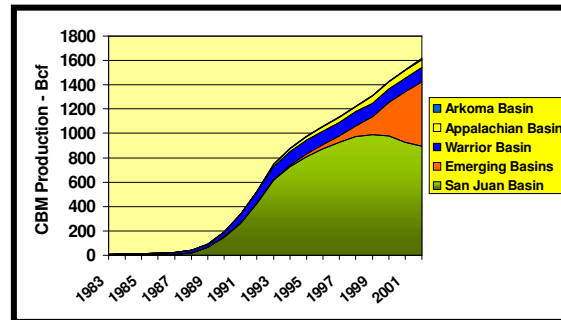
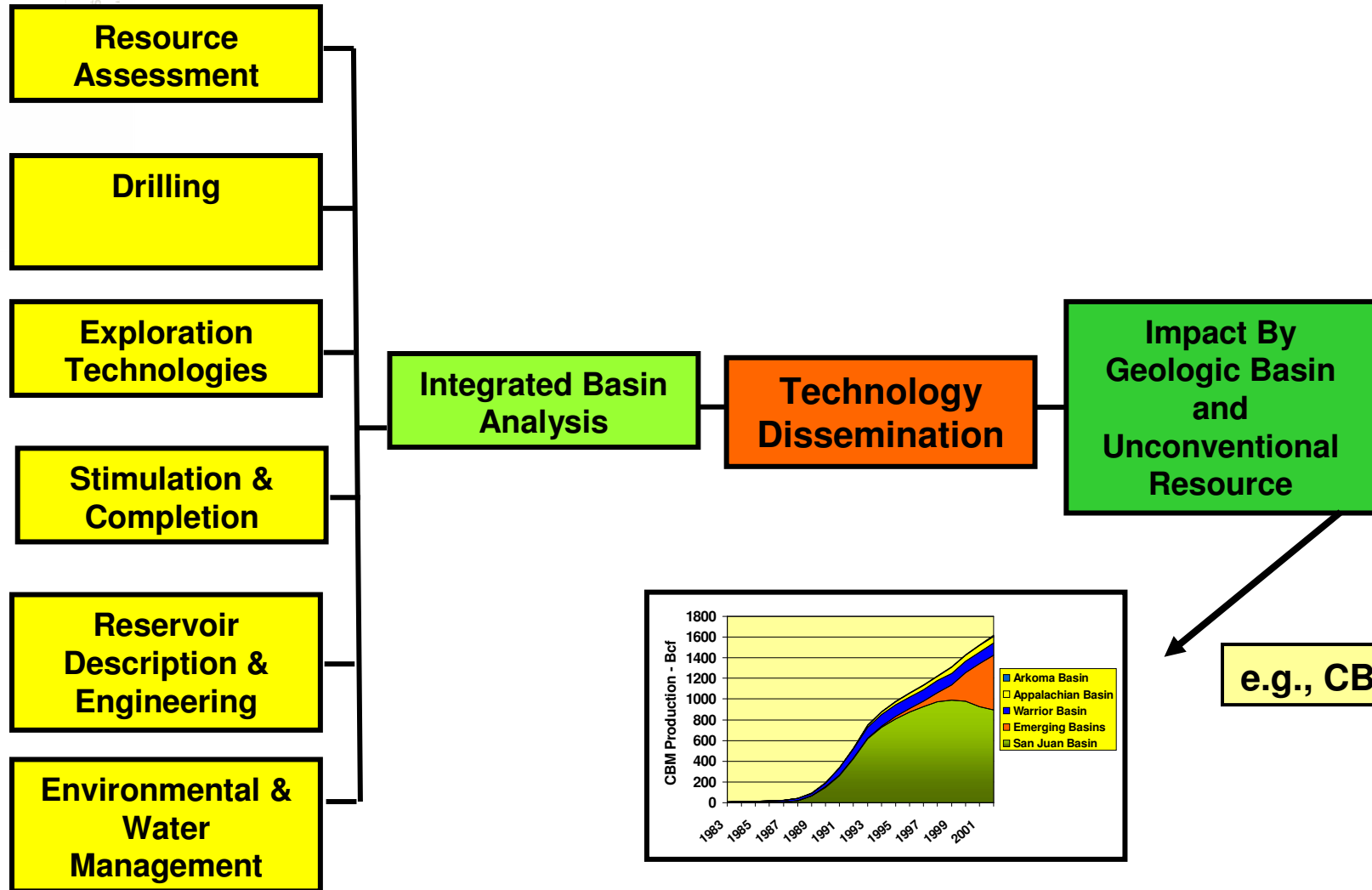


**Environment
al
Implications
in All**

**Aspects of
Operations**



RPSEA Unconventional Gas Program Components & Approach – Built Over 2007-2010



e.g., CBM

	CBM 10%	Gas Shales 45%	Tight Sands 45%
Integrated Basin Analysis	Low Priority	High Priority	Medium Priority
Drilling	Low Priority	High Priority	High Priority
Stimulation and Completion	Medium Priority	High Priority	High Priority
Water Management	Low Priority	Medium Priority	Medium Priority
Environmental	Medium Priority	Medium Priority	Medium Priority
Reservoir Description & Management	Low Priority	High Priority	Medium Priority
Reservoir Engineering	Low Priority	High Priority	High Priority
Resource Assessment	Low Priority	Low Priority	Low Priority
Exploration Technologies	Low Priority	High Priority	Medium Priority

H
M
L

High Priority
Medium Priority
Low Priority

Total Cost to RPSEA

	CBM 10%	Gas Shales 45%	Tight Sands 45%
Integrated Basin Analysis		New Albany (GTI) \$3.4	Piceance (CSM) \$2.9
Drilling			
Stimulation and Completion	Microwave CBM (Penn) \$.08	Cutters (Carter) \$.09 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22
Water Management	Integrated Treatment Framework (CSM) \$1.56		
Environmental			
Reservoir Description & Management		Hi Res. Imag. (LBNL) \$1.1	Tight Gas Exp. System (LBNL) \$1.7
Reservoir Engineering		Decision Model (TEES) \$.31	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52
Resource Assessment		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67
Exploration Technologies	Coal & Bugs (CSM) \$.86		
2008 Program Priorities	H	High Priority	2007 Projects
	M	Medium Priority	
	L	Low Priority	

	CBM 10%	Gas Shales 45%	Tight Sands 45%
Integrated Basin Analysis		New Albany (GTI) \$3.4	Piceance (CSM) \$2.9
Drilling			
Stimulation and Completion	Microwave CBM (Penn) \$0.8	Cutters (Carter) \$0.9 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95 Frac Cond (TEES) \$1.6	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22
Water Management	Integrated Treatment Framework (CSM) \$1.56	Barnett & Appalachian (GTI) \$2.5	Frac Water Reuse (GE) \$1.1
Environmental	*	Environmentally Friendly Drilling (HARC)* \$2.2	*
Reservoir Description & Management		Hi Res. Imag. (LBNL) \$1.1 Gas Isotope (Caltech) \$1.2 Marcellus Nat. Frac./Stress (BEG) \$1.0	Tight Gas Exp. System (LBNL) \$1.7 Strat. Controls on Perm. (CSM) \$0.1
Reservoir Engineering		Decision Model (TEES) \$.31 Coupled Analysis (LBNL) \$2.9	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52
Resource Assessment		Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67
Exploration Technologies	Coal & Bugs (CSM) \$.86	Multi-Azimuth Seismic (BEG) \$1.1	
2008 Program Priorities	H	High Priority	2007 Projects
	M	Medium Priority	2008 Projects
	L	Low Priority	

	Gas Shales	Tight Sands
Integrated Basin Analysis	New Albany (GTI) \$3.4 Marcellus (GTI) \$3.2 Mancos (UTGS) \$1.1	Piceance (CSM) \$2.9
Stimulation and Completion	Cutters (Carter) \$.09 Frac (UT Austin) \$.69 Refrac (UT Austin) \$.95 Frac Cond (TEES) \$1.6 Stimulation Domains (Higgs-Palmer) \$0.39 Fault Reactivation (WVU) \$0.85	Gel Damage (TEES) \$1.05 Frac Damage (Tulsa) \$.22 Foam Flow (Tulsa) \$0.57 Fracture Complexity (TerraTek) \$0.83
Reservoir Description & Management	Hi Res. Imag. (LBNL) \$1.1 Gas Isotope (Caltech) \$1.2 Marcellus Nat. Frac./Stress (BEG) \$1.0 Frac-Matrix Interaction (UT-Arl) \$0.46 Marcellus Geomechanics (PSU) \$3.1	Tight Gas Exp. System (LBNL) \$1.7 Strat. Controls on Perm. (CSM) \$0.1 Fluid Flow in Tight Fms. (MUST) \$1.2
Reservoir Engineering	Decision Model (TEES) \$.31 Coupled Analysis (LBNL) \$2.9 Shale Simulation (OU) \$1.05	Wamsutter (Tulsa) \$.44 Forecasting (Utah) \$1.1 Condensate (Stanford) \$.52
Exploration Technologies	Multi-Azimuth Seismic (BEG) \$1.1	
Drilling	Drilling Fluids for Shale (UT Austin) \$0.6	
Water Management	Barnett & Appalachian (GTI) \$2.5 Integrated Treatment Framework (CSM) \$1.56	Frac Water Reuse (GE) \$1.1
Environmental	Environmentally Friendly Drilling (HARC)* \$2.2	*
Resource Assessment	Alabama Shales (AL GS) \$.5 Manning Shales (UT GS) \$.43	Rockies Gas Comp. (CSM) \$.67
	Anchor Project	2007 Projects
	2009 RFP Focus	2008 Projects
	Novel Concepts	2009 Projects

RPSEA Unconventional Gas Projects

Cross-Cutting Technical Projects

- UT – Fracturing
- LBL – Self Teaching Expert System
- UT – Refracturing
- TAMU – Fracture Design
- TAMU – Decision Model
- LBL – High Resolution Imaging
- PSU – Microwave Coals
- Carter – Saws
- U of Tulsa – Novel Fracturing Fluids
- Stanford – Condensate
- HARC – Environmentally Friendly Drilling
- LBL – Coupled Reservoir Model
- TAMU – Fracture Conductivity
- BEG – Multi-azimuth Seismic
- Caltech – Gas Isotopes
- U of Tulsa – Foam Flow
- Higgs-Palmer – Stimulation Domains
- U of OK – Shale Reservoir Simulation
- MUST – Fluid Flow in Shales
- TerraTek – Fracture Complexity
- UT – Shale Drilling Fluids

Anchor Projects - Integrated Basin Analysis

Technical/Resource Projects

GTI – Marcellus Shale
 BEG – Marcellus Natural Fractures
 WVU – Fault Reactivation
 Penn – Marcellus Geomechanical
 GE – Frac Water Reuse

GTI – New Albany Shale

CSM – Piceance TGS
 CSM – Coal Bugs
 Utah GS - Paleozoic Shales
 U of Tulsa – Wamsutter
 CSM – Gas Composition
 U of Utah – TGS
 CSM – Produced Water
 CSM – Strat Control
 Utah GS – Mancos Shale

GTI – Barnett and Appalachia Produced Water
 UT Arlington – Barnett Fracture/Matrix Interaction

Alabama - Shales

Active or Completed Projects
 2009 Selections

\$45 Million Research Portfolio





Unconventional Resources Program

- **Selected Projects Presented at Annual Workshop (April 2010)**
 - Early dissemination of preliminary results
 - Critical review by PAC
 - Review by PI Group
 - Communication among PIs
 - Identify opportunities for cooperation
 - Define program gaps for 2010 solicitation
 - Provide direction for draft Annual Plan
- **Emphasis on Integration of Results**
 - Workshop ideas
 - Need for active integration of projects into program – Reflected in 2011 draft Annual Plan
- **2010 RFP, 2011 Plan Structured to Build Upon Existing**



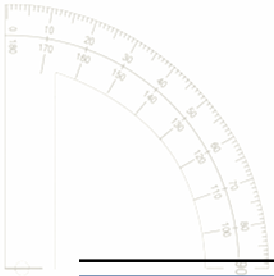
Last Year: 2010 Draft Annual Plan – Onshore Program Solicitation

- **Integrated Program Targeting a Specific Resource**
 - Build on existing projects
 - May be comprehensive or directed toward specific technology area
 - Topic areas amended as per URTAC recommendations
- **Early-Stage Research on Novel Concepts for Unconventional Gas Development**
- **Innovative Approaches to Integrate the Results of Individual Projects**
- **Additional Emphasis in 2010 Solicitation**
 - **Improved drilling technology**
 - Gap identified by PAC and others
 - Increase efficiency and effectiveness of well construction
 - **Environment and Safety**
 - Industry credibility damaged by Deepwater Horizon
 - Ensure risks of unconventional gas development are clearly identified

2011 Draft Annual Plan – Onshore Program Solicitation


- **Environment and safety risk assessment, reduction and mitigation**
 - Explicit focus, increased emphasis in all aspects of program
- **Innovative approaches for project integration**
 - Plan and manage field trials
 - Integrate the results of existing projects
 - Plan tech transfer
- **Develop an integrated resource-focused program**
 - **Topic areas (amended as per 2010 URTAC recommendations)**
 - Resource Assessment
 - Geosciences
 - Basin Analysis and Resource Exploitation
 - Drilling
 - Stimulation and Completion
 - Water Management
 - Reservoir Description and Management
 - Reservoir Engineering
 - Environmental
- **Novel concepts for unconventional gas development**





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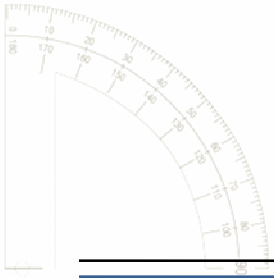
2011 Draft Annual Plan – Small Producer Program

- **Mission & Goals**

- **Unchanged from 2007-2010**
- **Increase supply from mature resources**
 - Reduce cost
 - Increase efficiency
 - Improve safety
 - Minimize environmental impact

- **Objectives**

- **Near Term**
 - Improve water management & optimize water use
 - Improve oil & gas recovery in mature fields, extending economic life
 - Reduce field operating costs
- **Longer Term**
 - Apply developed technologies to new basins/areas and develop new technologies to address the same objectives



The Technology Challenges of Small Producers

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 while reducing environmental impact





Small Producer Program – 2007-2008 Projects & 2009 Selections

- **Nineteen projects addressing concerns of small producers operating mature assets**
 - Produced water treatment (2)
 - Reservoir Characterization (3)
 - Enhanced oil and gas recovery (7)
 - Environmental impact & increased efficiency (4)
 - Stimulation, improved recovery and sweep efficiency (3)
- **Projects each involve a consortium of researchers and small producers**
- **Small Producer Research Advisory Group (RAG) actively involved**


2010 Draft Annual Plan – Small Producer Program

- **Awards to be made to Consortia**
 - Small producers or organized for the benefit of small producers
 - Small producer: ≤ 1000 BOEPD
- **2011 Annual Plan Solicitations**
 - Theme: **Advancing Technology for Mature Fields**
 - Path to initial application is critical
 - Complement 2007-2010 project selections



Secure Energy for America

– **Increased environmental and safety emphasis**



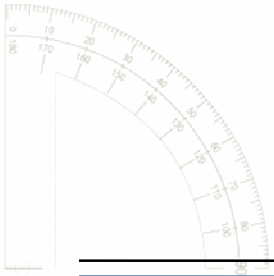
2010 Draft Annual Plan – Small Producer Program

- **Technology Challenges**

- Water management
- Improve recovery/extend economic life of reservoirs
- Reduce field operating costs and decrease environmental impact
- Well monitoring and reservoir modeling to allow efficient field operations
- Improved methods for well completions and recompletions
- Field tests of emerging technology
- Well and field data management
- Capture and reuse of waste products to reduce costs or increase recovery
- Leverage existing wellbores and surface footprint to maximize recovery
- Novel Concepts to increase production from mature fields

- **Other topics addressing the program theme of Advancing**

Technology for Mature Fields are welcome



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Technology Transfer Approaches

- **Engagement of PAC and TAC Members**
 - Project selection and review
 - Participation in field tests as “early adopters”
- **Active Coordination with NETL on Knowledge Management Database (KMD)**
- **PTTC Engagement – Contract under review by NETL**
- **RPSEA Website Enhancement**
 - Project information
 - Program direction
- **2.5% set-aside for tech transfer in each subcontract**

Secure Energy for America – **1.5% Project Level**

Project-Level Technology Transfer

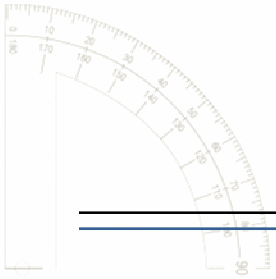
- **Funded by 1.5% Set-aside**
- **Managed by subcontractors**
 - Project-specific websites
 - Participation in conferences, workshops
 - Preparation of articles for journals, trade publications



Program-Level Technology Transfer

- **Funded by 1% Set-aside**
- **Managed by RPSEA**
 - Website Enhancements
 - Coordination with NETL KMD, PTTC activities
 - Events at Major Technical Conferences (SPE, AAPG, SEG, etc.)
 - Directed publications, e.g. *GasTips*
 - RPSEA Forum Series, e.g. New Albany Shale Forum, June 2009, Unconventional Resources Workshop, April 2010





Questions?

