UDAC Recommendations

Roy Long
Technology Manager, EPAct 2005 Title IX, Subtitle J, Section 999

Overview of UDAC 2009 Recommendations Recommendation Areas

- **R&D Program Focus**
- **Program Scope**
- **Process**
- **Program Progress & Value**
- **Societal Impact**

R&D Program Focus Area

- **Safety and environmental projects should be considered as separate topics**.
- Safety and environmental projects should be **identified with specific phases of the exploration and production lifecycle**.
- The **project impact assessment utilized in the project selection process should be made public and available to the UDAC**.
- Fund projects which address the overall safety impact of UDW activity.
- Fund projects which address the overall environmental impact of UDW activity.
- The metocean program should be strengthened regarding wind and wave predictions.
- Environmental studies should address the biological and ecological impacts, both positive and negative, of UDW activity.
- The UDW Program element should be primarily directed at R&D that drives step changes in the industry (i.e., **Grand Challenges**).

Program Scope Area

- Expand the Plan's scope to petroleum provinces within the definition of EPAct (e.g., Arctic) and undertake technology development to maximize the supply of domestic oil and gas. Caution should be exercised to avoid diluting available funds in a way that impacts the total size of projects and promoting the most beneficial R&D technologies.
- **Seek cooperation and experience with similar programs internationally** in order to gain leverage/ synergy and avoid redundancy/duplication of effort.

Process Area

- Continue **monitoring IP rights** in the project selection/award process.
- The RFP solicitation process should be reviewed to allow a broader approach to problem identification and solving to promote “out of the box” thinking and a broader base of respondents.
- Explore and implement ways to further streamline the contract award process.
- Perform an after action review to identify the key success elements of the Unconventional Program and apply these learnings to the UDW Program element, as appropriate**.**
- Conduct a **survey of the UDW research community to identify process changes which may yield increased response to UDW RFPs.**
- **Promote higher cost share proposals** by increasing the weight allocated to the cost share element in the proposal evaluation and selection process
- **Consider in-kind contributions** in the cost share element of the proposal (e.g., rig time, vessel utilization, core samples, etc.)
- **Encourage private funding sources to support the UDW Program element**
- The Complementary Program should identify and assign resources to UDW technology needs specified in the Plan that are unfunded and not redundant.

Program Progress & Value Area

- The referenced status reports (Management Performance and Budget Metrics, Program Benefits Assessment) should be made available to the public through the "Technology Transfer" vehicles used by NETL and RPSEA (i.e., web sites, public mailers, etc).
- Produce a quarterly executive summary document using a simple table format. An example of the data to be included follows:
  - Reference year of funding allocation
  - Number of projects solicited
  - Number of projects awarded
  - Contract award value
  - Project name and affiliate (university, private sector company, etc.)
  - Projected start and completion dates
  - Value of the UDW Program element (estimated by Benefits Assessment)
  - Projected additional federal royalty
  - Potential jobs created
- **Funding levels should be closely monitored** and appropriation authorization provided by EPAct (section 999H[e]) may need to be activated in the future.
- **Continue EPAct** and other programs of this nature to provide R&D for the required UDW technologies throughout the entire E&P lifecycle (find, develop, produce & abandon), which will take place over the next several decades.

Societal Impact Area

- Fund projects on atmospheric or oceanic research that clearly demonstrate a benefit to UDW development, not merely augmenting research already funded by other government agencies. (See R&D Program Focus)
- Emphasis should be placed on **environmental projects which study the impacts of UDW activity, both positive or negative** (noted in Program Content).
- Define strategies for assessing and monitoring potential environmental impact, both positive and negative**.** Consider developing a detailed document describing what is known and not known about the ecology of UDW environments, and how oil/gas exploration, drilling, and production activities could potentially impact environmental quality, productivity, and sustainability.
- **Encourage continuation of the practice of private funding of fellowships/scholarships/internships supporting UDW R&D programs** to enhance future workforce and attract young professionals to the oil and gas industry.

Themes from Recommendation Areas

- **Cost Shared Research Support**
  - identify and assign resources to UDW technology needs specified in the Plan that are unfunded and not redundant.
- **Program Environmental Focus**
  - Fund projects which address the overall safety impact of UDW activity
  - Fund projects which address the overall environmental impact of UDW activity
  - metocean program should be strengthened regarding wind and wave predictions.
  - address the biological and ecological impacts, both positive and negative
  - Expand scope to petroleum provinces (e.g., Arctic)
  - Promote “out of the box” thinking and a broader base of respondents.
  - Fund projects on atmospheric or oceanic research that clearly demonstrate a benefit to UDW development
- **Technology Transfer**
  - Identify the key success elements of the Unconventional Program and apply these learnings to the UDW Program
  - Make status reports (Management Performance and Budget Metrics, Program Benefits Assessment) available to the public through “Technology Transfer”
  - Produce a quarterly executive summary document using a simple table format

Outline from Recommendation Themes

- **Cost Shared Research Support**
  - NETL Direct Complementary and Program Support
- **Program Environmental Focus**
  - Current ES&H Initiatives
  - New Solicitation Environmental Support
    - 2010 Solicitation Strategy
    - Organization
- **Technology Transfer**
  - Overall Plan
  - Partners and Products
    - Knowledge Management Database
  - Benefits: Establishing Program Value

Cost Shared Research Support

- **NETL/Albany support to DW1403 - SWRI: Fatigue Performance of High Strength Riser Materials for Improvement of materials behavior/performance in extreme environments**
  - Key failure mechanisms in Cl- and H2S-environments identified via industry
  - Ambient-pressure fatigue testing initiated for corrosion fatigue (H2S)
  - Completed design of HPHT fatigue test unit; procurement/installation initiated

- **NETL and University Partners support to DW1202: Equation of State (EOS) Improvement for Extreme High Pressure and High Temperature Conditions (xHPHT)**
  - Project initiated July 14, 2009
  - Goal: Provide advanced EOS solutions for reservoir fluids at extremes of 30 KSI and 250^{o} C

- **NETL Environmental FOA: Closed June 5, 2009**
  - Water resources & water management for shale gas development
  - Science to support regulatory streamlining and permitting associated with shale gas development
  - Alaskan water management solutions for issues arising from development of local oil and natural gas resources for use by remote communities.

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Current ES&H Initiatives

Program Need 6: HS&E Concerns (Safety and Environmental)

- **Metocean Needs That Impact Operations and Facility Design**
  - DW1801 (2007): Effect of Global Warming on Hurricane Activity
  - DW2801 (2008): Gulf Three Dimensional Operational Current Model Pilot
- **HS&E Concerns with Emerging New Technologies**
  - DW33xx (2009 RFP): Subsea Processing and Seabed Discharge of Produced Water
    - Proposals addressing review and evaluation of existing regulations, standards and HS&E requirements that may govern deepwater surface and/or seabed direct discharge of produced water, define relative seabed conditions, environment, and marine toxicology will be of interest.
    - Cost/benefit/impact assessments and conceptual design(s) of subsea processing systems(s) that incorporate discharge of solids and produced water at the seafloor and proposals on other related topics will also be requested.

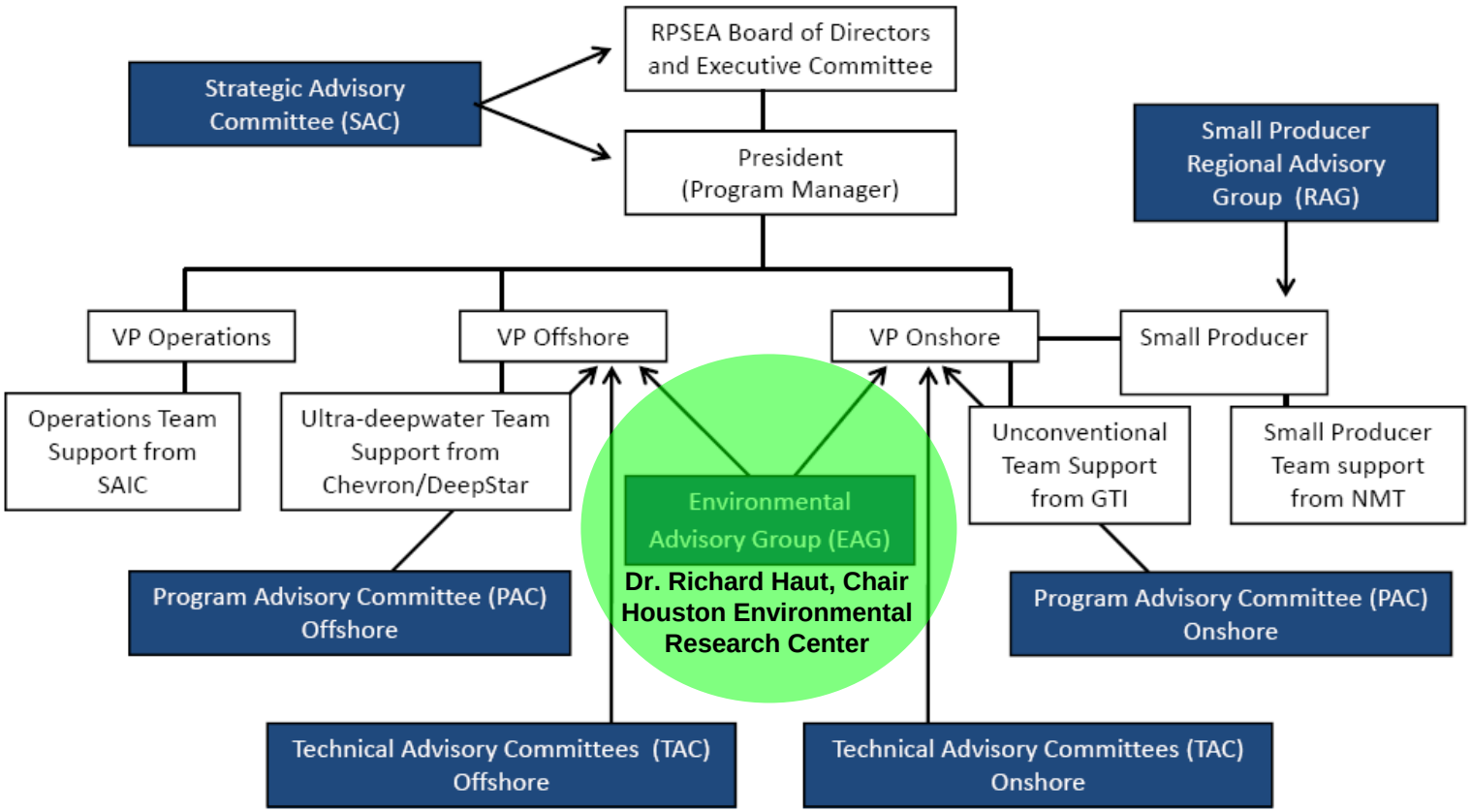
New RFP Environmental Support 2010 Strategy

- **As in 2009, RFP's directed to UDW needs and initiatives in a very general way**
- **Desired Outcomes**
  - Proposers have considerable latitude regarding methods and processes of accomplishment
  - Generation of truly novel proposals from a broader community of experts

New RFP Environmental Support: Organization
Environmental Advisory Group (EAG)

NAME	AFFILIATION
Dr. Richard Haut, Chair	Houston Advanced Research Center
Dr. Steve Bryant	The University of Texas at Austin
Sharon Buccino	Natural Resources Defense Council
David Burnett	Texas A&M University
Dr. Russ Johns	The University of Texas at Austin
Dr. Joe Kiesecker	The Nature Conservancy
Roy Long	National Energy Technology Laboratory
Dr. Pam Matson	Stanford University
Dr. Charles Newell	Groundwater Services, Inc.
Øyvind Strøm	StatoilHydro
Dr. Mason Tomson	Rice University

New RFP Environmental Support: Organization



Environmental Advisory Group (EAG) - Environmental stewardship is at the core of all RPSEA activities. The EAG is designed to provide input to the Program regarding environmental issues. It organizes and brings together key experts and policy leaders from academia, regulatory entities, non-governmental organizations, and industry for road mapping exercises to identify key regulatory barriers/issues.

New RFP Environmental Support: Houston Advanced Research Center (HARC)

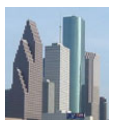
About HARC

HARC is a 501(c)(3) not-for-profit organization dedicated to improving human and ecosystem well-being through the application of sustainability science and principles of sustainable development.

Current Activities

Dr. Richard C. Haut, HARC senior research scientist has been invited to be the speaker at the may luncheon meeting for the **Texas Association of Environmental Professionals**. The topic of his presentation: **"balancing nature with future energy needs"**

May 4, 2009: HARC Launches the Study of Houston Atmospheric Radical Precursors (SHARP)



April 27, 2009: HARC Intern studies legal barriers to regulation of industrial benzene emissions in Houston

HARC's Three Priorities

Air Quality & Climate

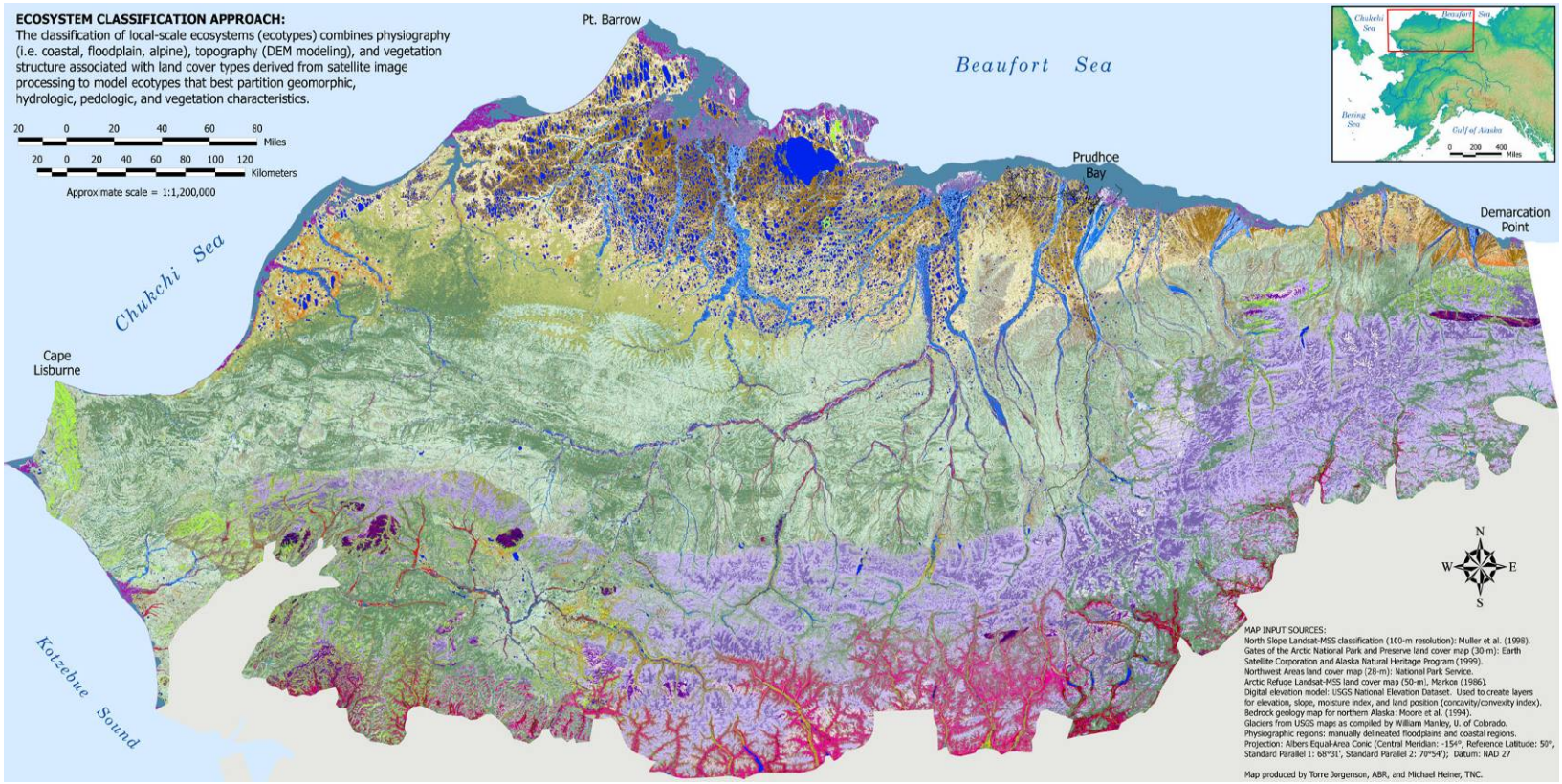
Clean Energy

Human & Natural Systems

HARC / Industry Example Project (Alaska)

Ecosystem and Biodiversity Measurement and Assessment

Develop tools for adaptive ecosystem management to assist integrated management of land, water and living resources that promotes conservation and sustainable use.



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Technology Transfer: Overall Plan

NETL has developed and will implement a Technology Transfer plan that provides the internal process for integrating information from the following DOE Oil and Gas Programs for dissemination to a broad audience of stakeholders:

- **Methane Hydrates**
- **Effective Environmental Protection**
- **(Unconventional) Oil**
- **EPAct 2005, Title IX, Subtitle J, Section 999**
- **Congressionally Directed Projects**

Technology Transfer Partners and Products

- **Partners:**
  - PTTC
  - RPSEA
  - New Technology Transfer Agreement (Existing ends 8/30)
    - Solicitation closed May 15, 2009

- **Products:**
  - E&P Focus Newsletter
  - RPSEA Workshops and Conferences
  - Active engagement of trade press for technology publications
  - Publications and workshops from the New Tech Transfer agent
  - NETL Website
    - **Knowledge Management Database/System**

NETL Technology Transfer Program

Information to be Delivered

	RPSEA	NETL	Contractors	DOE-HQ
Project Reports		Complementary program	Interim and final reports	
Project Data Sets		Complementary program	Spreadsheets, GIS, other	
Project Software			Models and online tools	
Presentations/papers	Program and project level	Program and project level	Project level	High Level Program
Program Information	RFPs, deliverables, metrics, feedback	Program updates, benefit assessments		Program activity, FAC reports, mandated info.

Delivery Vehicle

Project websites			Selected projects have websites	
Program websites	RPSEA site with links	Portal on NETL site with links		Pages on DOE site
Publications	Newsletter, articles in trade press	Newsletter, Techlines, articles in trade press	Technical papers, articles	Press relaeases, Techlines
Forums/workshops	RPSEA forums and workshops	PTTC workshops		
Public meetings	SPE papers, other technical meetings	SPE papers, other technical meetings	SPE papers, other technical meetings	

URTAC 2009 Technology Transfer Publications Currently Available

Section 999 Tech Transfer Index

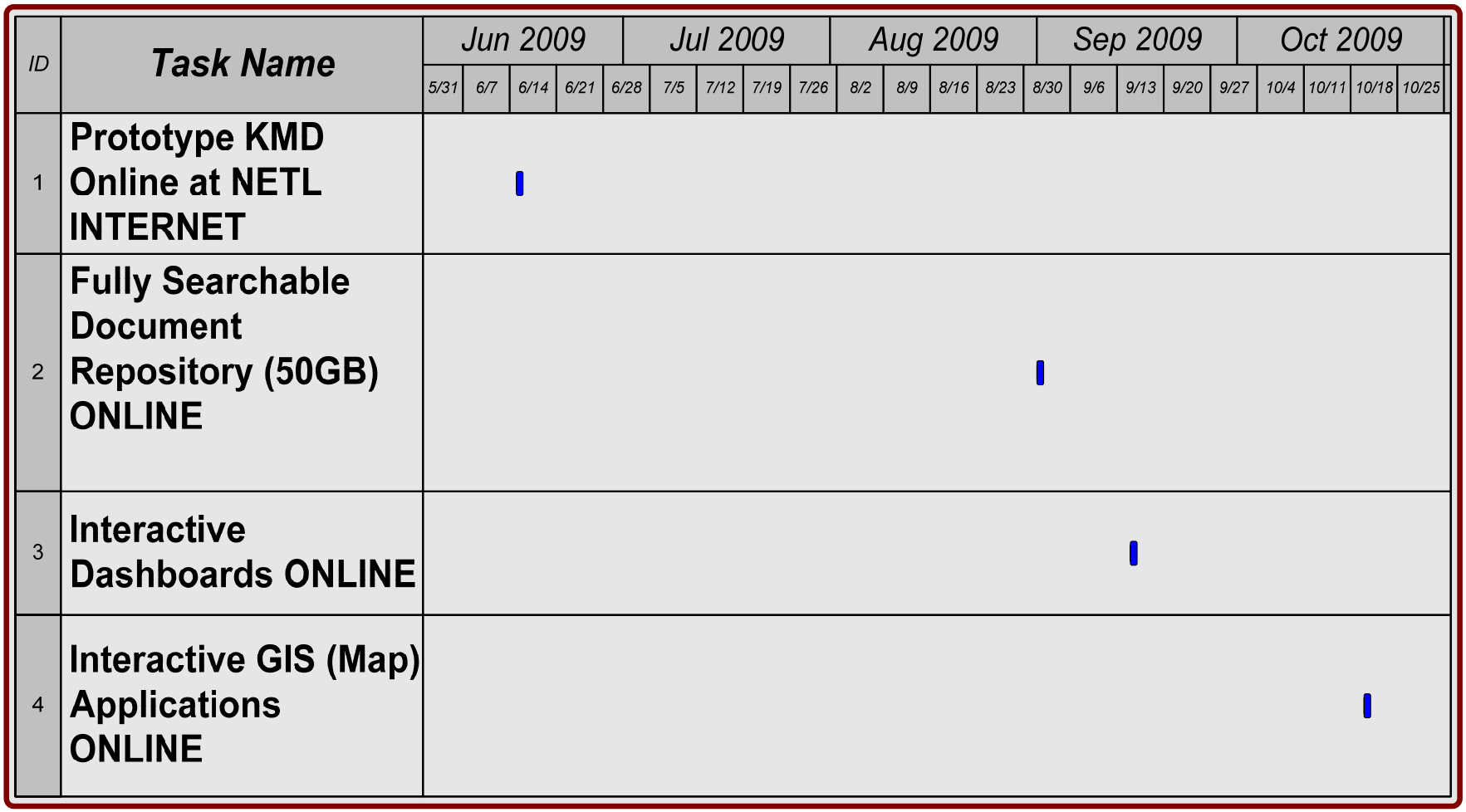
	A	B	C	D	K	L	M	N	O	P	Q	
1	Area	Project	Performer	Contract Number	Performer Address	PI	Project Cost	Federal Cost	Cost Share	Start Date	End Date	RP Cor
2	Small Producer	Field Site Testing of Low Impact Oil Field Access Roads: Reducing the Environmental Footprint in Desert Ecosystems	TEES	07123-01	1470 William D Fitch Pkwy College Station, TX 77845		$444,839	$284,839	$160,000	9/3/2006	9/2/2010	Mu Ca
3	Small Producer	Preformed Particle Gel for Conformance Control	University of Missouri, Rolla	07123-02	Missouri University of Science and Technology-OSP 202 University Center,300 W 12th St Rolla, MO 65409-1330		$706,716	$520,212	$266,504	9/15/2006	7/29/2010	Ca
4	Small Producer	Near Miscible CO2 Application to Improve Oil Recovery for Small Producers	University of Kansas	07123-03	Youngberg Hall 2385 Irving Hill Road Lawrence, KS 66045	Jyun Syung Tsau	$342,714	$274,171	$68,543	5/23/2006	5/29/2010	Kent
5	Small Producer	Enhancing Oil Recovery from Mature Reservoirs Using Radial-jetted	University of Kansas	07123-04	Youngberg Hall 2385 Irving Hill Road		$519,441	$248,385	$271,056	6/25/2006	8/24/2009	Mu Ca
6	Small Producer	Cost-Effective Treatment Of Produced Water Using Co-Produced Energy Sources For Small Producers	New Mexico Tech (NMIMT)	07123-05	801 Leroy Place Socorro, NM 87801		$1,164,888	$457,253	$707,635	9/9/2006	8/9/2010	Kent
7	Small Producer	Seismic Stimulation to Enhance Oil Recovery	Lawrence Berkeley National Laboratory	07123-06	One Cyclotron Road, MS90R200 Berkeley, CA 94720		$1,373,373	$723,373	$650,000	9/15/2006	8/14/2010	Mu Ca
8	Small Producer	Reducing Impacts of New PIT Rules on Small Producers	New Mexico Tech (NMIMT)	07123-07	801 Leroy Place Socorro, NM 87801		$763,396	$509,[illegible]	$254,211	9/19/2006	9/5/2011	Kent
9	Unconventional	Novel Concepts for Unconventional Gas Development in Shales, Tight Sands and Coalbeds	Carter Technology	07122-07	9702 Garden Flow Drive Sugar Land, Texas 77478	Ernest Carter	$94,600	$91,680	$22,920	7/24/2006	2/19/2008	Kent
10	Unconventional	Application Of Natural Gas Composition To Modeling Communication Within And Filling Of Large Tight-Gas-Sand Reservoirs, Rocky Mountains	Colorado School of Mines	07122-09	1500 Illinois Street Golden, CO 80401	Harris	$1,016,417	$670,417	$346,000	8/25/2006	8/24/2010	Kent
11	Unconventional	An Integrated Framework for the Treatment and Management of Produced Water	Colorado School of Mines	07122-12	1500 Illinois Street Golden, CO 80401	[illegible]g Drewes	$4,017,085	$1,560,393	$2,456,692	9/12/2006	3/19/2011	Kent
12	Unconventional	Comprehensive Investigation of the Biogeochemical Factors Enhancing Microbially Generated Methane in Coal Beds	Colorado School of Mines	07122-14	1500 Illinois Street Golden, CO 80401	Junk Munakata-Marr	$1,246,740	$864,333	$382,407	9/12/2006	9/19/2010	Kent
13	Unconventional	[illegible] Stimulated Gas	Colorado School of Mines	07122-15	[illegible] Golden, CO [illegible]	Dag [illegible]	$7,526,256	$2,894,256	$4,634,000	9/19/2006	9/18/2010	Kent

UncRes+SP / UDW / [illegible]eports / Presentations / Publications / Forums / Meetings /

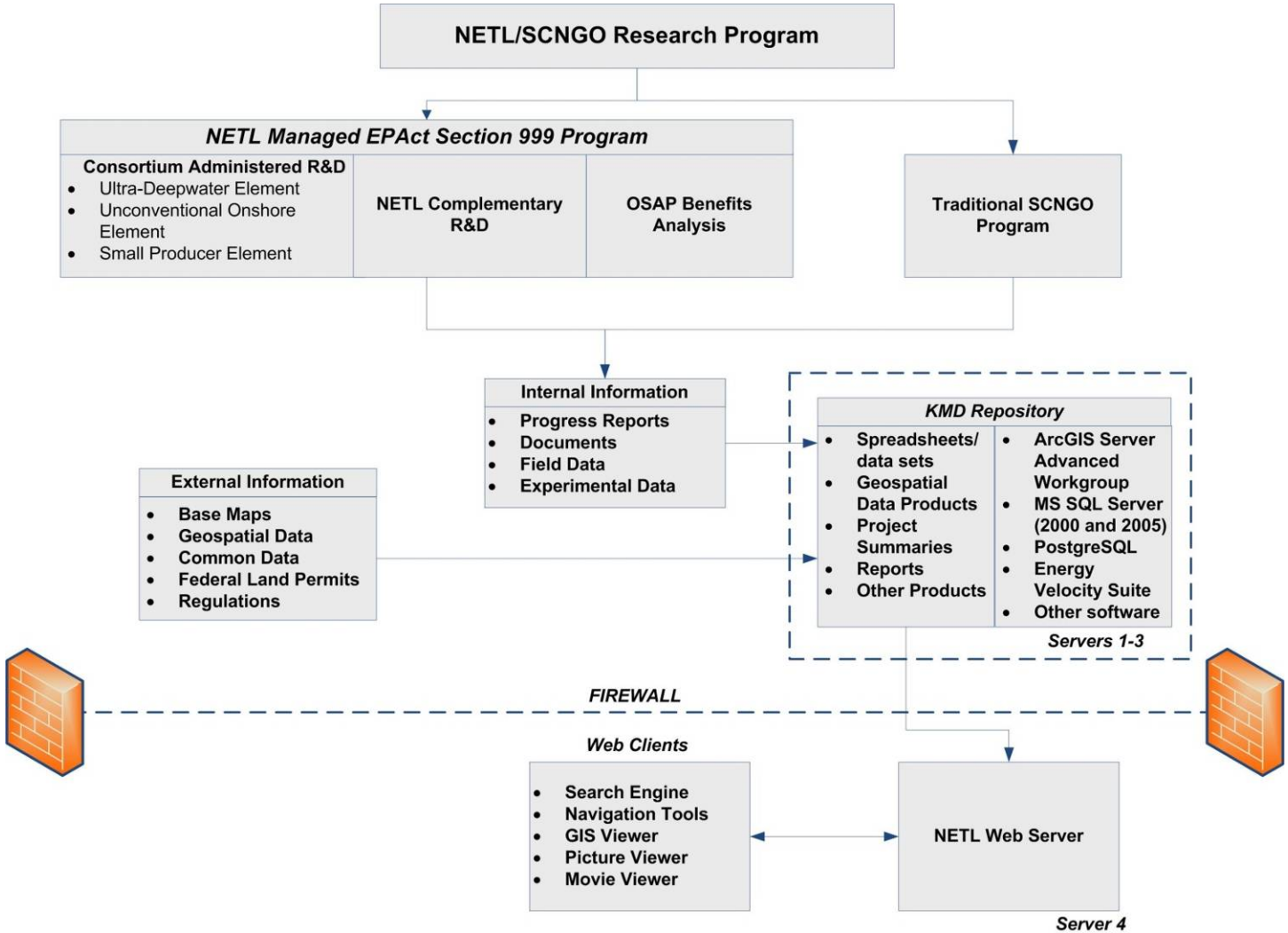
- **2 Primary Worksheets: Unc. Resources/Small Producers and UDW … list all basic project information: Who, What, Where, When, How Much, as well as all tech transfer products/delivery dates**

- **Other work-sheets roll up tech transfer items by type, date and program area**
- **Each document is linked to its location on NETL, RPSEA, FE-HQ or PI website**
- **Additional worksheet provides future planned events - RPSEA forums, meetings, papers, presentations, etc.**
- **Spreadsheet will be updated regularly and can be easily e-mailed**

Technology Transfer: NETL KMD Deployment Timeline



Technology Transfer: NETL KMD Organization of Information Flow



KMD Planned Key Products/Capabilities

- **CD/DVD Library online containing previous oil and gas research at NETL**
  - Compiles historical research
  - Converts the NETL publications page to a dynamic library for retrieving documents
  - Maintains the CD/DVD tree structure for searching
  - Contains 45 CDs and DVDs with 9,000+ PDFs, 186 Word DOCs, 61 spreadsheets, and 217 databases
- **Document Database to allow searching of historical oil and gas research that will contain**
  - ProMIS technical/topical reports
  - Key publications from the CD/DVD library
  - Key publications from the OSTI database
  - Reference for copyright-protected documents and documents that are not available in electronic format
  - Additional documents from the NETL Morgantown library: 397 final reports in PDF format and references to 5,000+ additional hard-copy reports

KMD Planned Key Products/Capabilities

- **Xcelsius Models to provide a dashboard visualization of detailed oil and gas, and environmental data**
  - Outer Continental Shelf (OCS) Model
    - Details information for the OCS Regions and Planning Areas
    - Provides undiscovered technically recoverable resources (UTRR) for gas and oil
    - Allows user control to select region or planning area display of resources
    - Indicates resources by water depth
  - Allegheny National Forest Model
    - Display environmental data related to drilling in the Allegheny National Forest including well density and watershed boundaries
    - Future enhancements may include relationship of data to the Marcellus Shale, along with trends of data for roads and chemical analysis within the National Forest

KMD Planned Key Products/Capabilities

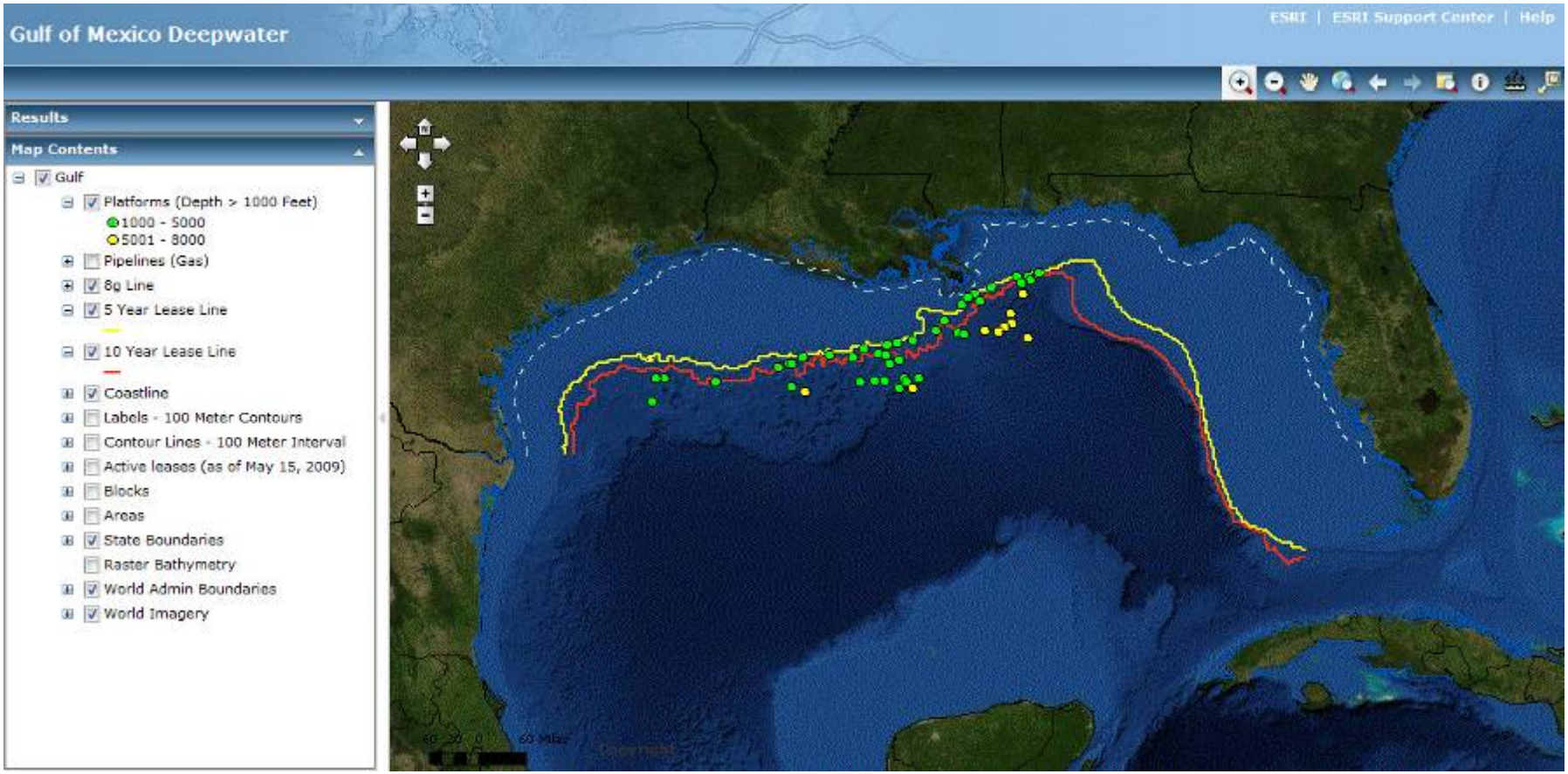
ArcGIS Web Map Services

allows visualization of data related to oil and gas research

- Gulf of Mexico (GOM) Deepwater
  - Data from the Minerals Management Service related to leases (i.e. 5- and 10-year lease lines, active leases, 8g line, coastline, state boundaries, and leases by water depth greater than 1,000 ft)
  - Infrastructure including platforms in water depth greater than 1,000 ft and gas pipelines
  - Location (area and block) and detailed bathymetry data for the GOM
- KMD – Oil and Gas Resources of the United States
  - Data from the Energy Policy and Conservation Act (EPCA) Phase III assessment for onshore oil and gas resources and restrictions/impediments to their development
    - Study area boundaries, land status, and land access categorization
    - Total oil density and total gas density per study area
    - Boundary data including Federal Lands, county/state boundaries, lakes/rivers, highways, railroads, and major cities
  - Data from the Energy Information Administration
    - Boundary data for U.S. oil and gas field maps
    - Coalbed methane cumulative production, reserves and resources, and gassy coal mines
    - Shale gas basins and plays

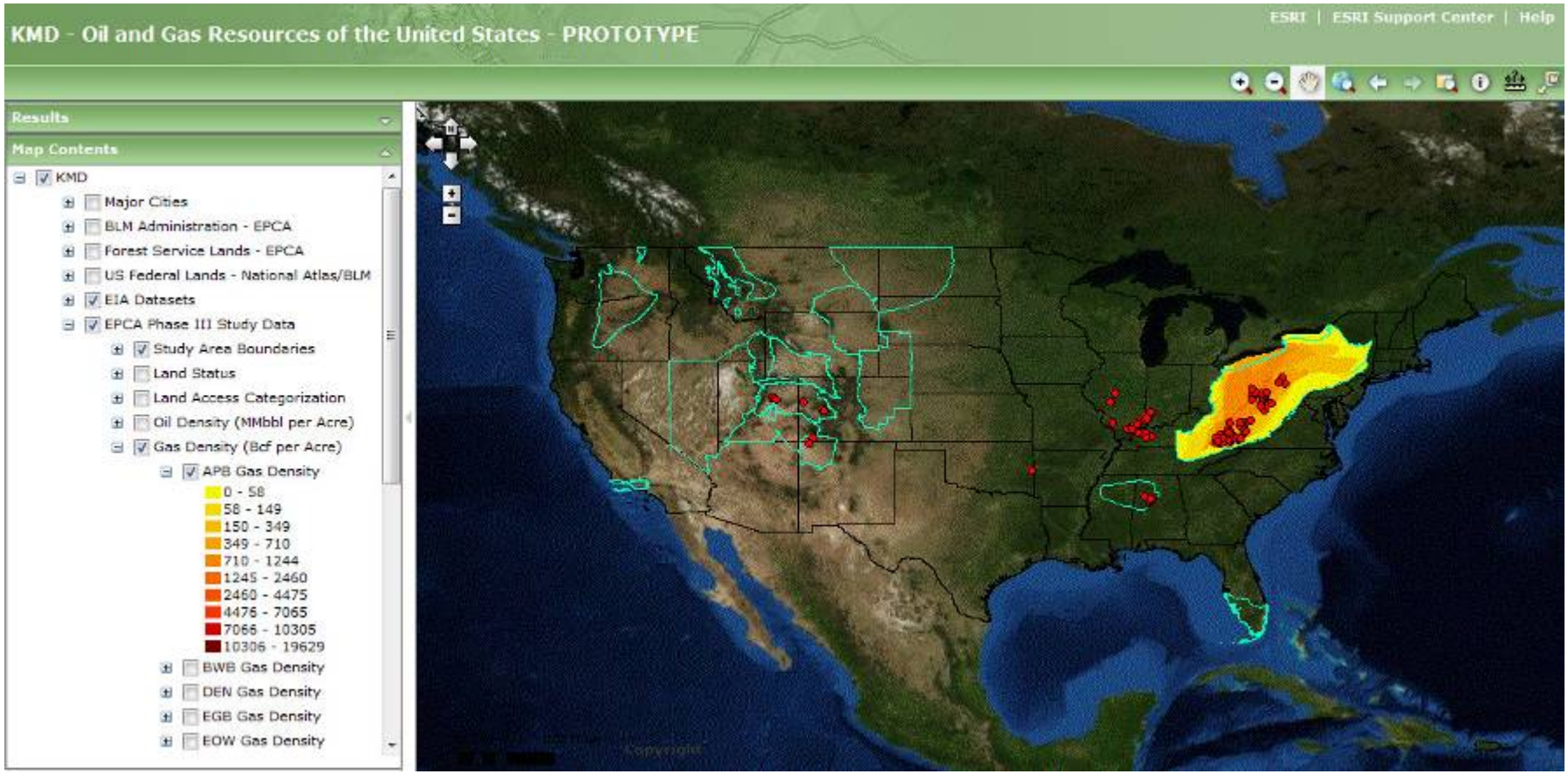
KMD Planned Key Products/Capabilities

Gulf of Mexico Deepwater ArcGIS Prototype



KMD Planned Key Products/Capabilities

Onshore Oil and Gas Resources of the U.S. Prototype



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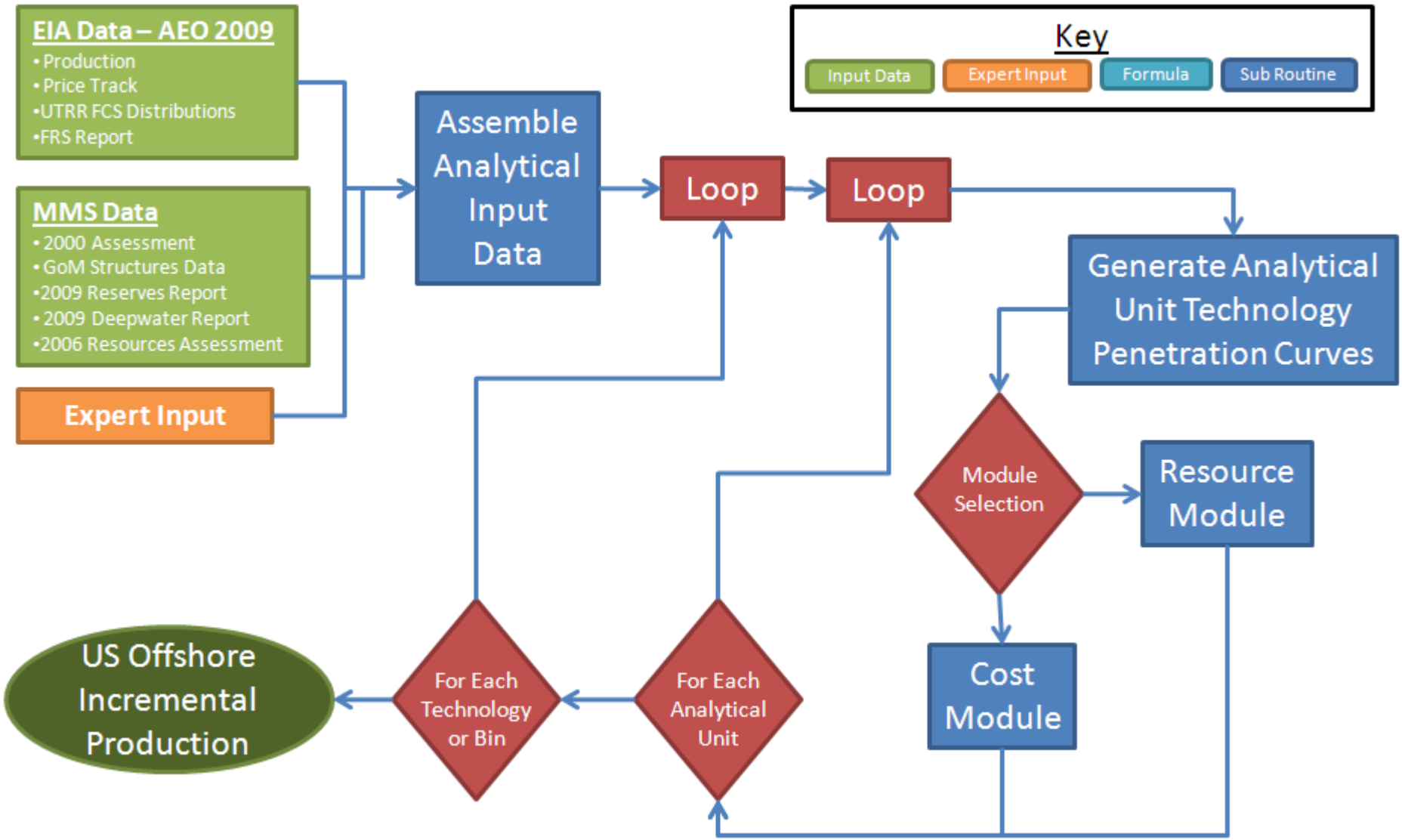
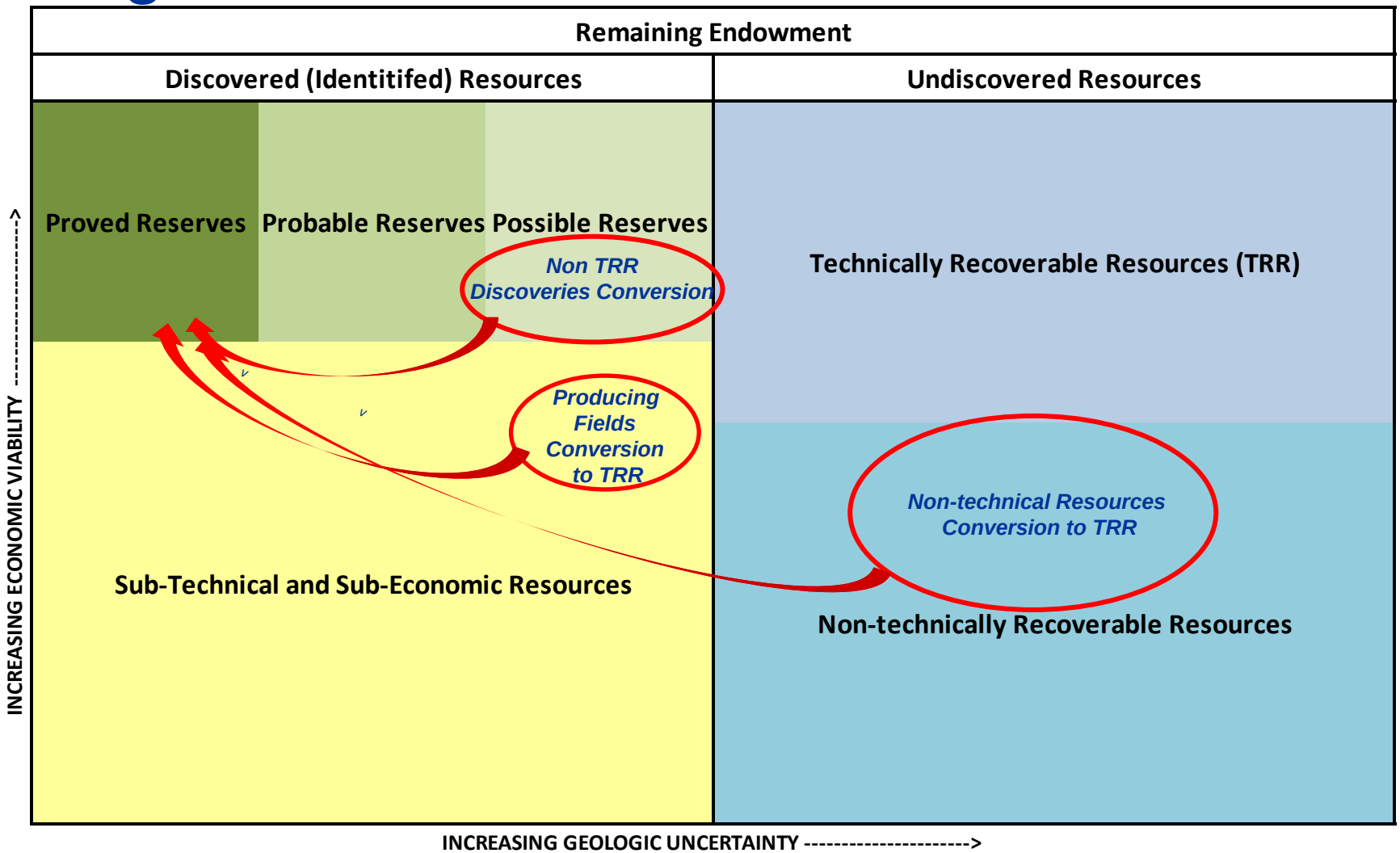
EPAct 999 Benefits Process Methodology for UDW Projects



UDW Research Portfolio: Targets Relative to the Offshore Endowment



UDW Technology Portfolio—Binning

Project Number	Project Name	Bin	Resource Impact	Cost impact	Notes
DW1201	Wax Control in the Presence of Hydrates	Crosscutting	N/A	Allows more cost effective handling of waxy oil *where it exists* in GoM	
DW1301	Improvements to Deepwater subsea measurements	Subsea Completion	Increased resource recovery efficiency	N/A	
DW1302	Ultra-High Conductivity Umbilicals	Subsea Completion	Increased resource recovery efficiency	Subsea production from distances that is greater than current technology allows	Competitive with 1902
DW1401	Composite Riser for Ultra Deepwater High Pressure Wells	Crosscutting	Ultra deep water and high pressure	Non-ultra deep areas	Expect a significant weight savings from steel
DW1402	Ultra Deepwater Dry Tree System for Drilling and Production	Dry Tree	N/A	Competitive with Spar platform economics	Change in subsea to dry tree ratio (Δ SS/DT)
DW1402	Ultra Deepwater Dry Tree System for Drilling and Production	Dry Tree	N/A	Competitive with Spar platform economics	Change in subsea to dry tree ratio (Δ SS/DT)
DW1403	Fatigue Performance of High Strength Riser Materials in Sour Environments	Crosscutting	N/A	Reducing cost by reducing design risk in entire GoM	
DW1501	Extreme Reach Development	Crosscutting	N/A	Devlopment of resources beyond the reach of current horizontal drilling technology limits	Change in subsea to dry tree ratio (Δ SS/DT)
DW1603	Flow Phenomena in Jumpers-Relation to Hydrate Plugging Risk	Subsea Completion	N/A	Lower operation cost for all subsea completion	
DW1603	Hydrate Characterization & Dissociation Strategies	Subsea Completion	N/A	Lower operation cost for subsea completion in UDW	
DW1603	Design investigation of extreme high pressure, high temperature, (XHPHT), subsurface safety valves (SSSV)	Crosscutting	Ultra deep water and high pressure	Increased recovery due to lower cost	
DW1603	Robotic MFL Sensor for Monitoring and Inspection of Deepwater Risers	Subsea Completion	N/A	Increased production due to lower cost for all GoM	
DW1701	Improved Recovery Analysis	Crosscutting	All future undiscovered resources	N/A	
DW1801	Effect of Global Warming on Hurricane Activity	Crosscutting	N/A	Quantify the risk mitigation and design cost improvement for increased certainty in knowledge of	
DW1901	Subsea Systems Engineering Integration	Subsea Completion	Increased resource recovery efficiency	Lower cost Subsea production	Complementary to both 1902 and 1302
DW1902	Deep Sea Hybrid Power System	Subsea Completion	Increased subsea resource recovery at distances that is greater than current	N/A	Competitive with 1302
DW2001	Geophysical Modeling Methods	Crosscutting	Subsalt resources	N/A	

Questions