



Advanced Resources  
International, Inc.

June 2013

*Advanced Resources'  
Senior Staff:*

Stephen Bumgardner

Steven M. Carpenter

Michael L. Godec

Jason A. Hummel

Jonathan R. Kelafant

George J. Koperna Jr.

Vello A. Kuuskraa

Anne Y. Oudinot

Robin Petrusak

Scott H. Stevens

# Advanced Resources International QUARTERLY UPDATE

*Unconventional Resources • Enhanced Recovery • Carbon Sequestration*

Advanced Resources International is a professional services firm that provides geological, reservoir engineering, business and policy analysis and advice on a global basis related to unconventional gas resources, enhanced oil recovery and geologic carbon sequestration. Our quarterly update highlights current industry trends, ongoing and completed projects, recent publications, upcoming workshops and events, and company news. We encourage you to visit our website at [www.adv-res.com](http://www.adv-res.com) to learn more about our company history, research and technology activities, industry news and much more. You may also contact our offices listed at the bottom of this page for additional information.



## “USTDA Concludes Participation in U.S. – India Strategic Dialogue”

A special press release was made on June 24, 2013 by the U.S. Trade and Development Agency (USTDA) which awarded a \$588,685 grant to fund a feasibility study for the development of shale gas and shale oil in Deep Industry Limited's (DIL) conventional oil and gas production concession areas in India. The assistance will help DIL, a private Indian oil and gas exploration and development company, identify the most technically and economically promising areas in which to explore for shale gas and oil within their current concessions. The study will position U.S. companies to work with DIL on its shale gas and oil activities, thus opening the door to potential US exports. DIL has selected Advanced Resources International, Inc. of Arlington, VA to perform the work.

For more information:

[http://www.ustda.gov/news/pressreleases/2013/SouthAsia/India/USIndiaStrategicDialogue\\_062413.asp](http://www.ustda.gov/news/pressreleases/2013/SouthAsia/India/USIndiaStrategicDialogue_062413.asp)

[http://www.ustda.gov/news/pressreleases/2013/SouthAsia/India/USIndiaStrategicDialogue\\_FactSheet\\_062413.pdf](http://www.ustda.gov/news/pressreleases/2013/SouthAsia/India/USIndiaStrategicDialogue_FactSheet_062413.pdf)



## “Types of Storage (Mechanisms) and Lessons Learned from SECARB's Citronelle Storage Site”

George Koperna, a Vice President of Advanced Resources International made a presentation entitled, “Types of Storage (Mechanisms) and Lessons Learned from SECARB's Citronelle Storage Site”, at the RECS 2013 which was hosted by Southern Company in Birmingham, Alabama this June 17-26. His presentation discussed types of storage reservoirs and the manners in which CO<sub>2</sub> would be trapped or utilized within them. The underlying theme centered about the types of data that would need to be collected to estimate the storativity of a given reservoir type. The presentation then closed with an update of the SECARB Anthropogenic Test to set the stage for the subsequent RECS field site tour.

For more information:

<http://www.recsco2.org/program>

<http://www.recsco2.org/impact/view/1640>



## “Geologic Storage Standards, Legislation and Regulation: Developments and Implications for Commercial Deployment”

Steven M. Carpenter, a Vice President of Advanced Resources International, Inc. made a presentation entitled, “Geologic Storage Standards, Legislation and Regulation: Developments and Implications for Commercial Deployment”, at the RECS 2013 which was hosted by Southern Company in Birmingham, Alabama this June 17-26. This presentation described an overview of standards development relative to CCS and how those standards inter-relate to regulation and permitting. The SECARB Citronelle Anthropogenic Test site was used as an example of how the permits and regulations are applied in practice. The presentation concluded with a discussion of the U.S. participation in the ISO Technical Committee TC-265 which is developing an international standard for CCS. Mr. Carpenter is the Chair of the United States Technical Advisory Group (TAG) to ISO TC-265.

For more information:

<http://www.recsco2.org/impact/view/1644>

## “Opportunities for Utilizing Anthropogenic CO<sub>2</sub> for Enhanced Oil Recovery and CO<sub>2</sub> Storage”



On June 11th – 12th, Michael L. Godec, a Vice President of Advanced Resources International, Inc., attended a workshop entitled, “Introduction to Carbon Dioxide Enhanced Oil Recovery (CO<sub>2</sub>-EOR)”, in Houston and Port Arthur, Texas. The workshop was organized by the Center for Climate and Energy Solutions (C2ES), Permian CCUS Center, Railroad Commission of Texas, and North America 2050 (NA2050). The title of Mr. Godec’s presentation was, “Opportunities for Utilizing Anthropogenic CO<sub>2</sub> for Enhanced Oil Recovery and CO<sub>2</sub> Storage.” The main topics covered in this presentation were: (1) What is the potential for CO<sub>2</sub>-EOR in Texas, the U.S., and globally? (2) How much CO<sub>2</sub> storage could result from CO<sub>2</sub>-EOR? (3) Is CO<sub>2</sub> effectively stored during CO<sub>2</sub>-EOR operations? and (4) Who will most benefit from pursuing CCUS with CO<sub>2</sub>-EOR?

The objectives of the workshop were to: (1) introduce U.S. state and Canadian provincial officials to CO<sub>2</sub>-EOR and its potential; (2) educate workshop attendees on the technical, economic, environmental and regulatory aspects of CO<sub>2</sub>-EOR; (3) allow representatives from industry, non-government organizations (NGOs), federal agencies, and U.S. state governments to provide their perspectives of CO<sub>2</sub>-EOR; and (4) examine U.S. federal and state-level policies that incentivize the development of CO<sub>2</sub>-EOR or provide a regulatory background for CO<sub>2</sub>-EOR activities.

For more information:

<http://na2050.org/wp-content/uploads/2013/06/CO2-EOR-Workshop-Judi-Greenwald.pdf>

<http://na2050.org/wp-content/uploads/2013/06/CO2-EOR-Workshop-Michael-Godec.pdf>



### “World Shale Gas and Shale Oil Resource Assessment”

The study, “World Shale Gas and Shale Oil Resource Assessment”, performed by Advanced Resources International, Inc. with sponsorship of the U.S. Energy Information Administration (EIA), targeted 95 shale basins and 137 shale formations in 41 countries (excluding the U.S.). For purposes of completeness, we have also provided information from Advanced Resources International’s proprietary data base of U.S. shale gas and shale oil resources.

For more information:

<http://www.adv-res.com>

<http://www.eia.gov/analysis/studies/worldshalegas/>



### “Potential for Enhanced Gas Recovery and CO<sub>2</sub> Storage in the Marcellus Shale in the Eastern United States”

Two papers by Advanced Resources International personnel will be published in a forthcoming journal addressing enhanced gas recovery and CO<sub>2</sub> storage in the Marcellus Shale. One paper, to be in a forthcoming edition of the journal Energy Proscenia is entitled, “Assessment of Factors Influencing CO<sub>2</sub> Storage Capacity and Injectivity in Eastern U.S. Gas Shales”, was co-authored by Michael Godec, George Koperna, Robin Petrusak, and Anne Oudinot, all of Advanced Resources International, Inc. A second paper entitled, “Potential for Enhanced Gas Recovery and CO<sub>2</sub> Storage in the Marcellus Shale in the Eastern United States”, by the same coauthors, was published in the International Journal of Coal Geology, and is available online as of May 28, 2013. Both papers report on geological characterization conducted that estimated total gas in-place and theoretical maximum CO<sub>2</sub> storage capacity within the Marcellus. Detailed reservoir simulation was performed to develop a better understanding of the shale characteristics influencing potential enhanced gas recovery, storage capacity, and injectivity. The study estimates that for the entire Marcellus shale study area, approximately 12 trillion cubic meters (Tm<sup>3</sup>) of methane are technically recoverable, and would result in 55 billion tonnes (Get) of CO<sub>2</sub> storage capacity.

For more information:

<http://www.sciencedirect.com/science/article/pii/S0166516213001377>



### “Potential Global Implications of Gas Production from Shales and Coal for Geological CO<sub>2</sub> Storage”

Another paper by Advanced Resources International personnel will be published in a forthcoming edition of the journal Energy Proscenia, entitled, “Potential Global Implications of Gas Production from Shales and Coal for Geological CO<sub>2</sub> Storage,” which was co-authored by Michael Godec and Hunter Jonsson of Advanced Resources International, Inc, along with Lyudmila Basava-Reddi of the IEA Greenhouse Gas Programme. This paper builds upon previous work to assess the global potential for geological storage of CO<sub>2</sub> in shale and coal formations, as well as the impact of gas production from shales on CO<sub>2</sub> storage capacity in underlying deep saline formations. This includes assessment and characterization of: (1) the global status of hydrocarbon production from shales and coal seams; (2) the potential theoretical capacities for CO<sub>2</sub> storage in shales and

coals; and (3) containment issues arising from shale fracturing, both for shales as a storage medium, and in terms of cap rock integrity for underlying storage units, particularly deep saline formations.



### 12th Annual Conference on Carbon Capture Utilization & Sequestration

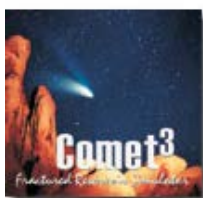
In May, Michael Godec, Vice President of Advanced Resources International, Inc. presented two papers at the Exchange Monitor's 12th Annual Conference on Carbon Capture Utilization & Sequestration Conference in Pittsburgh, Pennsylvania. The titles of these presentations were "Assessment of Factors Influencing Effective CO<sub>2</sub> Storage Capacity and Enhanced Gas Production in Eastern U.S. Gas Shales", which also described the research sponsored by the U.S. Department of Energy to assess factors influencing effective CO<sub>2</sub> storage capacity and injectivity in the Marcellus Shale in the Eastern United States and "Potential Global Implications of Gas Production from Shales and Coal for CO<sub>2</sub> Geological Storage", which summarized recent work to assess the global potential for geological storage of CO<sub>2</sub> in shale and coal formations, including assessment and characterization of: (1) the global status of hydrocarbon production from shales and coal seams; (2) the potential theoretical capacities for CO<sub>2</sub> storage in shales and coals; and (3) containment issues arising from shale fracturing, both for shales as a storage medium, and in terms of cap rock integrity for underlying storage units, particularly deep saline formations.



For more information:

<http://carbonsq.com/>

[http://www.carbonsq.com/pdf/2013/advance\\_agenda.pdf](http://www.carbonsq.com/pdf/2013/advance_agenda.pdf)



### COMET3 RESERVOIR SIMULATOR

Advanced Resources' COMET3 reservoir simulator for coalbed methane (CBM) and gas shale reservoirs was the first of its' kind in the marketplace, the initial version having been developed in the early 1980's when both resources combined contributed less than 1% to U.S. gas supply. Since then it has remained the industry-standard reservoir simulator for these reservoir types. Advanced technical features include:

- A triple-porosity/dual-permeability option for certain gas shale and coalbed methane (CBM) reservoirs
- Multi-component sorption for enhanced coalbed methane (ECBM) recovery and carbon sequestration (CO<sub>2</sub> sequestration) applications
- A robust permeability model A COMET3 brochure, as well as technical papers describing the model theories, and model testing and benchmarking studies, can be downloaded via the links below.

**COMET3 Brochure:**

[www.adv-res.com/pdf/COMET3\\_Brochure\\_SEPTEMBER\\_2012.pdf](http://www.adv-res.com/pdf/COMET3_Brochure_SEPTEMBER_2012.pdf)



### UPCOMING EVENTS

#### 2013 Carbon Storage R&D Project Review Meeting

Sheraton Station Square

Pittsburgh, PA

August 20-22, 2013

<http://netldev.netl.doe.gov/events/carbon-storage-review>

#### 2013 SPE Eastern Regional Meeting

David L. Lawrence Convention Center

Pittsburgh, PA

August 20-22, 2013

<http://www.erm-2013.org/>

#### The 30th Annual Pittsburgh Coal Conference

David L. Lawrence Convention Center

September 15-18, 2013

Beijing, CHINA

<http://www.engineering.pitt.edu/pcc/>

#### ISO TC-265 Carbon Dioxide Capture, Transportation, and Geologic Storage

China University of Petroleum-Beijing (CUPB) and the China National Institute of Standardization (CNIS)  
Beijing, China

September 23-25, 2013

[http://www.iso.org/iso/iso\\_technical\\_committee?commid=648607](http://www.iso.org/iso/iso_technical_committee?commid=648607)

**SPE Annual Technical Conference and Exhibition**

Ernest N. Morial Convention Center

New Orleans, Louisiana

September 30-October 2, 2013

<http://www.spe.org/atce/2013/>

**Carbon Management Technology Conference**

Hilton Alexandria Old Town

Alexandria, VA

October 21 – 23, 2013

<http://fscarbonmanagement.org/content/cmtc-2013>

**AAPG – 2013 Eastern Section Annual Meeting**

November 3-4, 2013

Morgantown, West Virginia

<http://www.aapg.org/sections/eastern.cfm>

**CO2 Flooding Conference Week**

December 9 - 13, 2013

Midland Center

Midland, TX 79701

<http://www.co2conference.net/>

For a complete list of industry news, recent white papers and case studies please visit our website [www.adv-res.com](http://www.adv-res.com) or contact one of our offices:

**Washington, DC**

4501 Fairfax Drive, Suite 910  
Arlington, VA 22203-1659

Phone: 703.528.8420  
Fax: 703.528.0439

**Houston, TX**

11931 Wickchester Ln, Suite 200  
Houston, TX 77043-4547

Phone: 281.558.9200  
Fax: 281.558.9202

**Knoxville, TN**

111 N Central Street, Suite 7  
Knoxville, TN 37923-1043

Phone: 865.541.4690  
Fax: 865.541.4688

**Cincinnati, OH**

1282 Secretariat Court  
Batavia, OH 45103

Phone: 513.460.0360