Preliminary Evaluation of Offshore Transport and Storage of CO_2*

Steven M. Carpenter[1]

Search and Discovery Article #80201 (2011)
Posted November 28, 2011

*Adapted from oral presentation at AAPG Eastern Section meeting, Washington, DC, September, 25-27, 2011

[1]Advanced Resources International, 1282 Secretariat Court, Batavia, OH 45103 (scarpenter@adv-res.com)

Abstract

The DOE-NETL has funded the Southern States Energy Board (SSEB) who have teamed with IOGCC (and others) to prepare a report that will have as its primary objective to conduct studies to evaluate the potential for geological storage of CO_2 utilizing existing offshore oil and natural gas fields in the Gulf of Mexico nearing the end of productive life, and in areas that have not been subject to oil and natural gas production (other than GOM). These offshore geologic settings, along with wells and infrastructure (where it exists), may be suitable for CO_2 sequestration with the adaptation of technical, regulatory, and business modifications. Inherent within this objective is the consideration of:

(1) resource mapping of CO_2 storage potential and infrastructure in SECARB's offshore areas under Federal jurisdiction in the Gulf of Mexico;
(2) resource mapping of CO_2 storage potential and infrastructure in the SECARB region offshore areas under state jurisdiction, and
(3) the current legal and regulatory structures and opportunities in applicable jurisdictions.

Research will be performed as part of a collaborative partnership between the Southern States Energy Board and the Interstate Oil and Gas Compact Commission (IOGCC), with technical assistance from the University of Texas at Austin, Bureau of Economic Geology (BEG) and from the Geological Survey of Alabama (GSA). The SSEB will manage the project, under its existing SECARB Phase III agreement.

The IOGCC Carbon Capture and Geologic Storage Task Force will conduct legal and regulatory research by means of specific subgroups created for each project. These subgroups will: 1) conduct research and analyses; and 2) draft findings and recommendations and/or guidance documents, potentially including suggested amendments to IOGCC's CO_2 model legislation and rules. The IOGCC will work closely with the SECARB partnership to evaluate the legal and regulatory structures of the states involved. Research topics include an evaluation of current legal and regulatory structures, identification of challenges stakeholders may face, and identification of legal and regulatory opportunities.

Copyright © AAPG. Serial rights given by author. For all other rights contact author directly.

Preliminary Evaluation of Offshore Transport and Storage of Carbon Dioxide

Advanced Resources International, Inc.

Presented By:
Steven M. Carpenter, Vice, President
ADVANCED RESOURCES INTERNATIONAL, INC.
Arlington, VA

September 27, 2011

National CO_2 Pipeline Infrastructure for CCS

Southeast Regional Carbon Sequestration Partnership

- USDOE-NETL
- SECARB/Southern States Energy Board (SSEB)
- Interstate Oil and Gas Compact Commission (IOGCC)
- SSEB CO_2 Pipeline Transportation Task Force (PTTF)

Disclaimer

"This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

Pipeline Task Force Composition

15 Authors & 34 Task Force Members

- Interstate Organizations
  - IOGCC
  - SSEB
- Federal Government
  - FERC
  - U.S. DOE & NETL
  - U.S. EPA
  - U.S. DOI
- Industry Representatives
- Environmental Representatives
- Scientists
- Legal Experts

National Pipeline Infrastructure Report

Four Parts

1. Overview
2. Background
3. Analysis
4. Recommendations


A Policy, Legal, and Regulatory Evaluation of the Feasibility of a National Pipeline Infrastructure for the Transport and Storage of Carbon Dioxide

Topical Report

Reporting Period Beginning April 1, 2009, and Ending December 31, 2010

Principal Authors:

Submitted to:

Southern States Energy Board
6325 Amherst Court
Norcross, Georgia 30092

Submitted by:

Interstate Oil and Gas Compact Commission
PO Box 53127
Oklahoma City, OK 73152-3127

September 10, 2010

Presenter's notes: The Pipeline Study was released on January 31, 2011, and consists of four parts:
1.The OVERVIEW section outlines SSEB and IOGCC's experience in the topic area, acknowledges those who funded and supported the project, and summarizes the objectives of the project.
2.The report provides BACKGROUND information on the basics of carbon dioxide capture technologies and geologic storage options.
3.The ANALYSIS section discusses the existing CO2 PL infrastructure in the U.S., the current regulations governing them, and future PL build-out scenarios.

4.Based on the finding from the analysis section, the Task Force provides a list of state and federal RECOMMENDATIONS.

Next Step to evaluate OCS

- *Advanced Resources International*
- *Armbrecht Jackson, LLP*
- *Bureau of Economic Geology, The University of Texas at Austin*
- *Geological Survey of Alabama*
- *IOGCC*
- *Mississippi State Mineral Lease Program*
- *SECARB*
- *State Oil and Gas Board of Alabama*
- *Southern Company*
- *Southern States Energy Board*
- *WESTCARB*

OCS Task Force Objectives

- *Some basic information and recommendations*
- *A guide to regulators, policy makers, legal professionals*
- *Evaluation of the potential for CO_2 storage, in sub-seabed geologic structures*
- *Analysis and consideration of legal and regulatory framework to facilitate offshore CO_2*

Preliminary Draft Report

Preliminary Evaluation of Offshore Transport and Storage of Carbon Dioxide

SSEB/IOGCC Offshore Task Force

Topical Report

Reporting Period Beginning October 1, 2009, and Ending September 30, 2011

Principal Authors:

Berry H. "Nick" Tew, Jr., Ph.D., Alabama State Geologist and Oil & Gas Supervisor, Geological Survey of Alabama and State Oil and Gas Board of Alabama
Conrad Armbrecht, Armbrecht Jackson, LLP
Darrick W. Eugene, Attorney, IOGCC Principal Investigator, Darrick W. Eugene & Associates, PC
Denise Hills, Geologist, Petroleum Systems & Technology, Geological Survey of Alabama
Ian Duncan, Ph.D., Associate Director, Gulf Coast Carbon Center, Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin
Jack Moody, Director, Mississippi State Mineral Lease Program
Jack C. Pashin, Ph.D., Director, Energy Investigations Program, Geological Survey of Alabama
Kimberly Sams, Geologist & Assistant Director, Geoscience Programs, Southern States Energy Board
Lorraine Hwang, Ph.D., WESTCARB, California Institute for Energy and Environment, University of California at Berkeley
S. Marvin Rogers, Counsel, State Oil and Gas Board of Alabama
Rebecca C. Smyth, M.A. P.G., Project Manager, Gulf Coast Carbon Center, Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin
Richard Esposito, Ph.D., Principal Research Geologist, Southern Company
Steven Carpenter, Vice President, Advanced Resources International
Tip Meckel, Ph.D., Research Scientist, Gulf Coast Carbon Center, Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin

SSEB and IOGCC Task Force

Submitted to:
Southern States Energy Board
6325 Amherst Court
Norcross, Georgia 30092

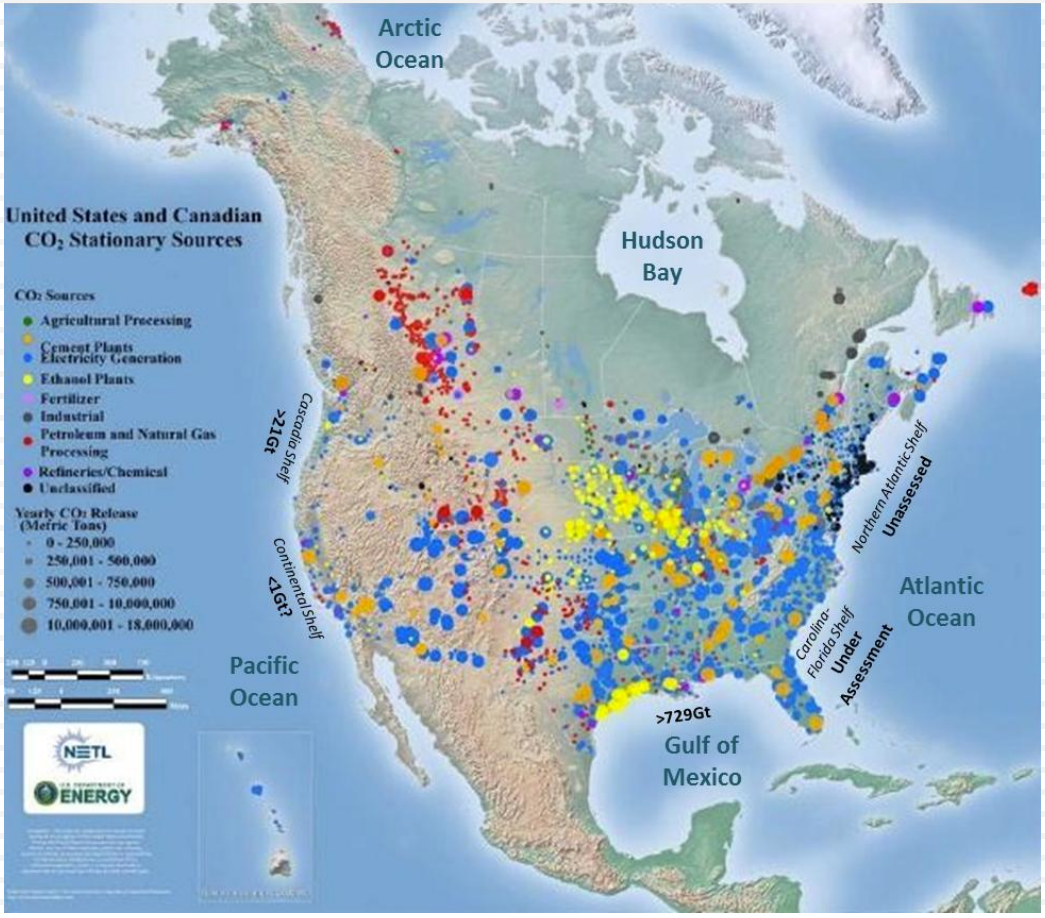
Submitted by:
Cynthia McCollum, Federal Projects Manager
Interstate Oil and Gas Compact Commission
PO Box 53127
Oklahoma City, OK 73152-3127

Draft September 19, 2011

Advanced Resources International, Inc.

The Good

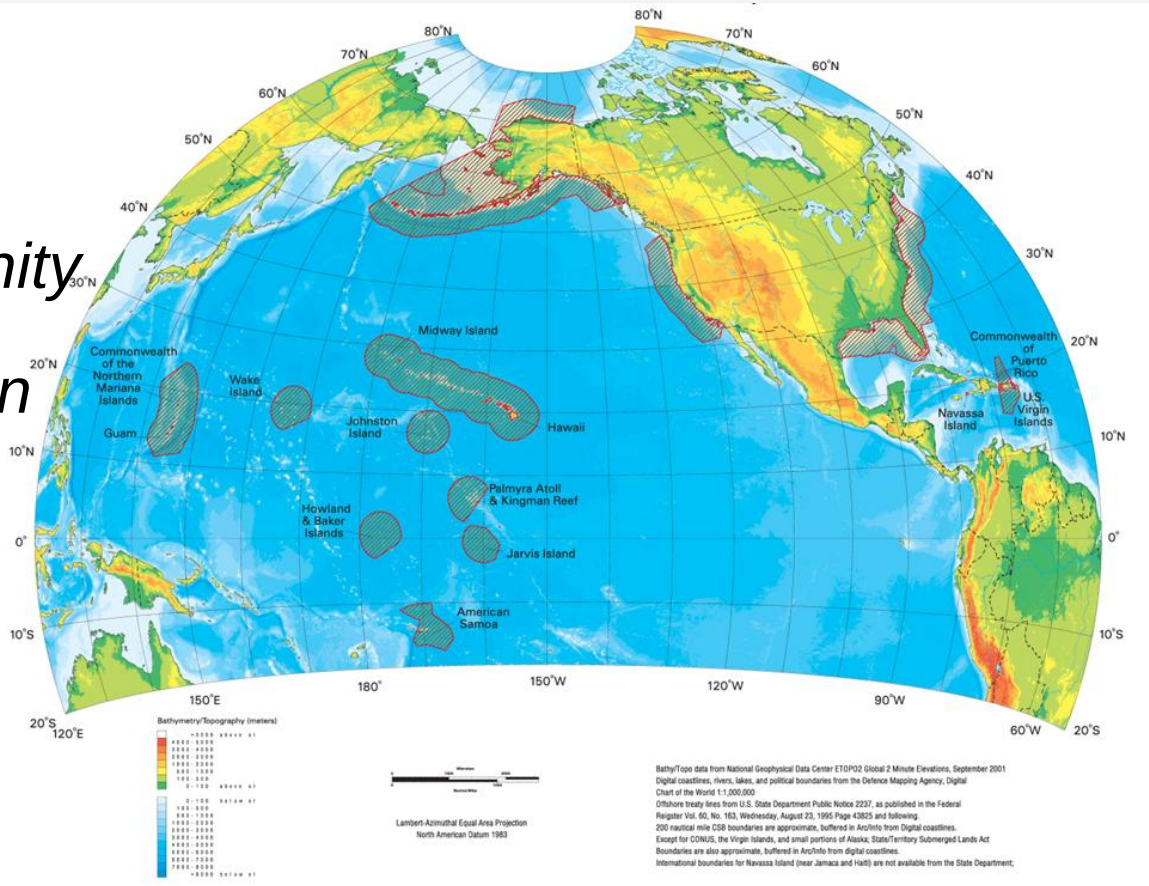
- *Sediment thicknesses from 15,000' to 50,000' thick*
- *Depth of storage will assure super-critical*
- *>1 trillion tons capacity*
- *Additional assessment to follow*



Advanced Resources International, Inc.

The Best – One landowner

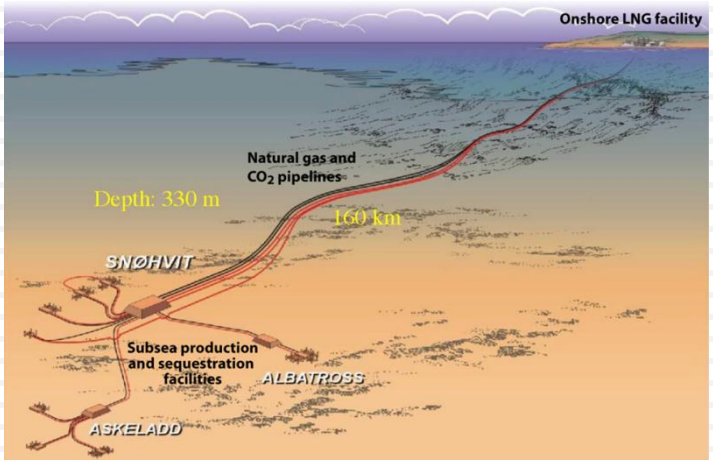
- *Single owner*
- *Sovereign Immunity*
- *Plume remains on controlled lands*
- *Benefits to government*



Advanced Resources International, Inc.

The Bad – Offshore EOR

- *Very applicable; however,*
- *Design & existence of infrastructure is lacking*
- *Economics and politics are a moving target*
- *More evaluation required*



The Bad

- *Marine environment is dynamic*
- *MVA must be risk based (v. prescriptive)*

-25 to -20	BLACK	NON-OPERABLE:	Evacuate the zone and or area/country
-16 to -10	RED	INTOLERABLE:	Do not take this risk
-9 to -5	YELLOW	UNDESIRABLE:	Demonstrate ALARP before proceeding
-4 to -2	GREEN	ACCEPTABLE:	Proceed carefully, with continuous improvement
-1	BLUE	NEGLIGIBLE:	Safe to proceed

MITIGATION / Control Measures / PREVENTION	Improbable 1	Unlikely 2	Possible 3	Likely 4	Probable 5
	LIKELIHOOD →				
Light -1	-1 1L	-2 2L	-3 3L	-4 4L	-5 5L
Serious -2	-2 1S	-4 2S	-6 3S	-8 4S	-10 5S
Major -3	-3 1M	-6 2M	-9 3M	-12 4M	-15 5M
Catastrophic -4	-4 1C	-8 2C	-12 3C	-16 4C	-20 5C
Multi-Catastrophic -5	-5 1MC	-10 2MC	-15 3MC	-20 4MC	-25 5MC

SEVERITY ↓

Advanced Resources International, Inc.

The Bad – Regulatory Morass

At the State level (5 x 12)

- *O&G wells*
- *UIC*
- *CO_2 Storage*
- *State Sea beds*
- *Off-shore O&G*

- *AL*
- *CA*
- *FL*
- *GA*
- *LA*
- *MS*
- *NC*
- *OR*
- *SC*
- *TX*
- *VA*
- *WA*

The Bad – Regulatory Morass

- DOI – BOEM
- EPA- SDWA, UIC, CWA, CAA, MRR, NEPA
- DOT - Pipeline and Hazardous Materials Safety Administration (PHMSA)
- USACE & USCG
- NOAA - Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA)

The Bad – Regulatory Morass

Subsea CCS includes jurisdiction >30 Federal Laws, including :

- *Outer Continental Shelf Lands Act*
- *Submerged Lands Act*
- *National Environmental Policy Act*
- *Endangered Species Act*
- *Coastal Zone Management Act*
- *Marine Mammal Protection Act*
- *Clean Air Act*
- *National Historic Preservation Act*

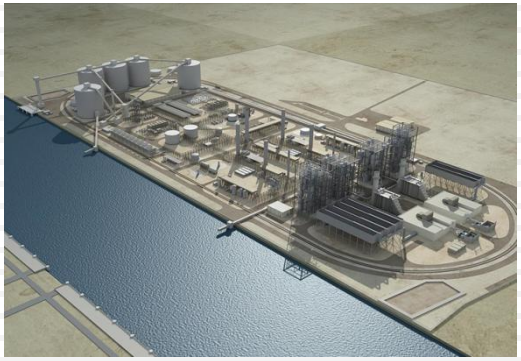
The Bad – The Obscure

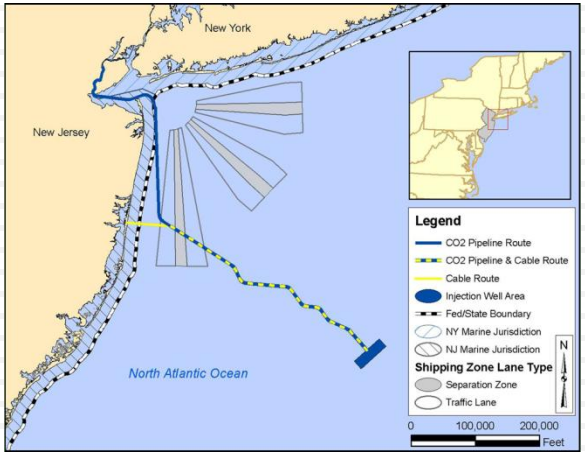
- *The London Convention – ocean dumping*
- *RCRA & CERCLA*
- American Indian Religious Freedom Act
- Executive Order 12777 - Implementation of Section 311 of the Federal Water Pollution Control Act of October 18, 1972, as Amended, and the Oil Pollution Act of 1990
- Rivers and Harbors Appropriation Act of 1899
- Archeological and Historical Preservation Act and the National Historic Preservation Act

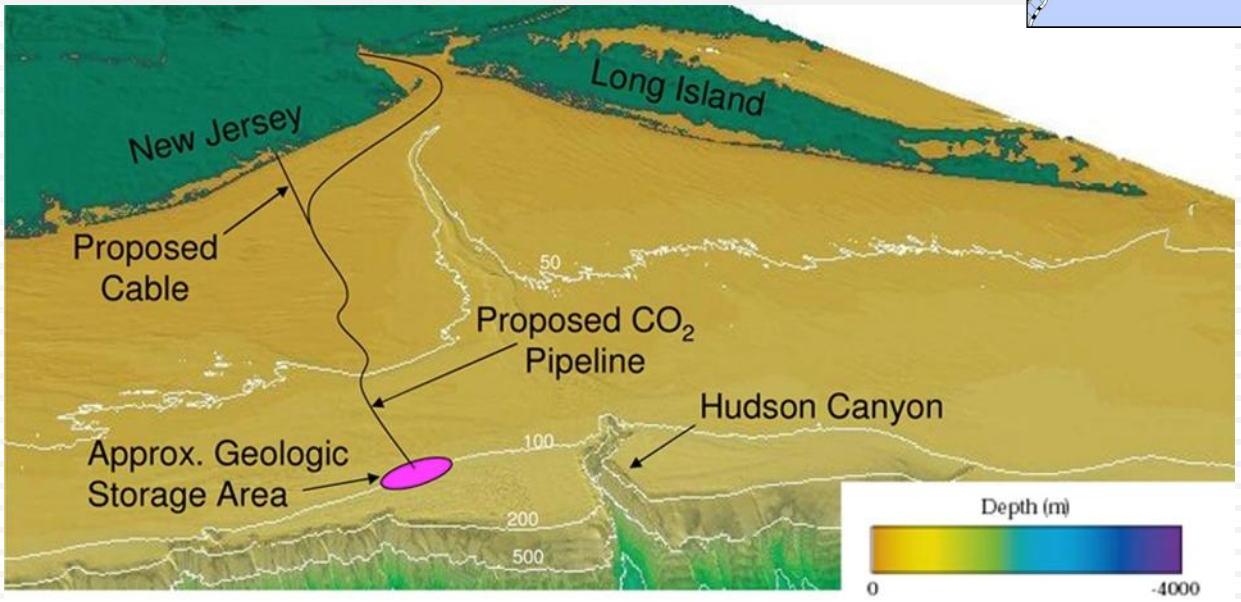
The Ugly

- *Time, and*
- *Money….*
- *Great Lakes*

The PurGen Project and others…







Advanced Resources International, Inc.

Questions, Comments, Concerns…

Steven M. Carpenter, VP

513-460-0360

scarpenter@adv-res.com

Offices:

Washington DC, Houston, TX

Knoxville, TN, Cincinnati, OH