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TITLE: Midcontinent Interactive Digital Carbon Atlas and Relational Database (MIDCARB)

Cooperative Agreement No.: DE-FC26-00NT40936

Contractor Name and Address: The University of Kansas Center for Research Inc.

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DOE Cost of Project: \$ 835,392 (Budget Year 1)

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OBJECTIVES

Current federal energy policy assumes that hydrocarbons will continue to be the primary source of energy for the United States and the world well into the 21st century. However, there is concern about increasing atmospheric concentrations of carbon dioxide and its possible role in global climate change. For this reason, it may become necessary to manage anthropogenic CO₂. Sequestering CO₂ in geological reservoirs may be one way to safely sequester carbon over long periods of time, if the proper data and tools to analyze the geological feasibility as well as the associated costs can be developed.

The Midcontinent Interactive Digital Carbon Atlas and Relational DataBase (MIDCARB), a digital spatial database for five states (Indiana, Illinois, Kansas Kentucky and Ohio), will allow users to identify the amount of CO₂ available for sequestration in

relation to a source supply, the geologic security and safety of a sequestration site, the long-term effects on a reservoir, and the cost of compression and transport of CO₂ between source and sequestration site. MIDCARB will organize and enhance the critical information about CO₂ sources, and develop the technology needed to access, query, model, analyze, display, and distribute natural-resource data related to carbon management.

Large stationary sources of CO₂ emissions will be identified, located, and characterized by volume, temperature, pressure, and gas mix. Potential CO₂ sequestration targets, including producing and depleted oil and gas fields, unconventional oil and gas reservoirs, uneconomic coal seams, and saline aquifers, will be characterized to determine quality, size, and geologic integrity. All information will be available online through user query. Information will be provided through a single interface that will access servers in each state. The economic impact and possible value of the CO₂ sequestration to hydrocarbon recovery from oil and gas fields, coal beds, and organic-rich shales will be considered.

PROJECT STATUS: A project meeting was held in Lawrence, KS on March 1-2 with multiple representatives from each member organization in attendance.

Project has just been initiated and an initial meeting was held. An organization and communication network that crosses institutional and geographic barriers is being created. Inventories of digital information pertinent to the MIDCARB project, and databases schemas at each participant are being assembled. Initial project web pages are being created and will be available at <http://www.midcarb.org>.

Scheduled Milestones:

Assessment of Potential CO ₂ Sources	06/01
Identify Geological Sequestration Locations	08/01
Compile Database Characterizing CO ₂ Sources	09/01
Characterize Oil, Gas and Brine Reservoir Properties	11/01
Characterize Coal Bed Fluid and Rock Properties	02/02
Characterize Unconventional Reservoir Properties	03/02
Assess Critical Reservoir Properties	06/02
Develop Web- Enabled Relational Database and GIS (First Products 02/01)	Ongoing
Evaluate Potential of Economic Modeling	11/01
Technology Transfer (First Products by 11/00)	Ongoing

Significant Scheduled Events

Eastern Section AAPG meeting, Kalamazoo, MI	09/01
Midwest/Great Lakes ArcInfo Users Group (MWFLAIUG) Conference 2001, Oak Brook, IL	09/01
Technology Transfer	Ongoing

SUMMARY OF TECHNICAL PROGRESS BUDGET PERIOD 1

Progress is reported for the period from 1 April 2001 to 30 June 2001.

In this third quarter, representatives from four of the five active partners attended the First National Conference on Carbon Sequestration in Washington DC in May and had an informal meeting. Progress has been made in opening computing connectivity between multiple surveys.

Two presentations are planned for the next quarter. Ken Nelson make a presentation on the computing aspects of MIDCARB at the Midwest/Great Lakes ArcInfo Users Group (MWFLAIUG) Conference in Oak Brook, IL in September and Jim Drahovdzal will talk about the MIDCARB project at the Eastern Section AAPG meeting in Kalamazoo, MI. MIDCARB meetings with representatives from each Survey will meet at these conferences.

Administrative: The domain name, www.midcarb.org, has been secured and is active.

Task 1: Assessment of CO₂ Sources – *Identify the CO₂ sources across the region including CO₂ emission mass production rates from utility and non-utility power plants and the geographic distribution of these plants.*

Illinois: Has downloaded EPA point source data and formatted to Access. Loading to Oracle will follow.

Kansas: Is in the process of pinpointing the locations of all fertilizer and chemical manufacturers in the State. The incorporation of small power plant data from EIA sources is on-going.

Compile Database Characterizing CO₂ Sources – *Compile a database of CO₂ emission source characteristics, including concentration, pressure, temperature, trace gases, and output pattern (base, seasonal or peaking).*

Kansas: Has begun collecting data on ethanol plants for the sources database.

Kentucky: The locations (lat/lon) for all the operating and recently permitted power plants in KY (regardless of EPA instrumentation) have been updated using Digital Ortho Quarter Quads (DOQQ's), USGS topos, and field checking with GPS. Also, lists of major coal and gas (non-utility) consumers within KY are being compiled from various state and federal sources. Available EDR data from 4th quarter 1997 through all of 2000 has been loaded into an Access97 database. EDR data for 1st quarter 2001 has been retrieved, the files expanded, and given to computer tech to load into database.

Characterize Oil, Gas and Brine Reservoir Properties – *Compile a representative database of oil, gas, and brine reservoir properties.*

Indiana:

1. Completed the digitization of oil and gas field boundaries for Indiana. The digitization of pipelines for Indiana has been initiated. Pipelines are being digitized from 1:63,000-scale base maps showing oil, gas, and products transportation networks.
2. Development of the IGS petroleum database continues. Work focused on creating data entry forms for entering stratigraphic information.
3. Initiated data entry of stratigraphic data associated with deep wells. This data will be used to map potential geological reservoirs for carbon sequestration.

Kentucky: Have created ArcView GIS shape files (approximate reservoir boundaries) for 100⁺ of the larger oil fields in western KY that are applicable to the study. Overlain upon these fields are the locations of wells with density and neutron porosity logs on file at KyGS. Based on the locations of these data, the “best” fields for CO₂ EOR are being identified.

KyGS has also created the proposed data parameters and table structures for a saline aquifer database and is in the process of writing a brief introduction and description of the proposed database guidelines for the review of the other States.

Characterize Coal Bed Fluid and Rock Properties – *Compile a representative database of coal bed fluid, rock properties, and enhanced coal-bed methane potential.*

A first draft of the data parameters and table structures for the coal database has been presented to the other surveys by Kentucky. This original draft was revised and edited, and the new version will soon be presented to the other surveys for approval.

Develop Web-Enabled Relational Database and GIS – *Develop an online relational database and web-enabled geographic information system (GIS) that can be queried to evaluate and determine options for sequestration. Queries would have spatial capabilities, and be based on critical parameters for CO₂ sequestration.*

Illinois: The new Sun workstation server is up and running and ArcSDE software has been acquired. Efforts are now underway to load Oracle 8i and ArcSDE onto system, train staff in SDE management, and begin assessment of other dataset elements and formatting needs.

Indiana: Began testing the ArcSDE (Spatial Database Engine) software that will allow connectivity of GIS data between State survey IMS (Internet Map Server) Web pages.

Kansas: Installed a base layer map for the MIDCARB web-site and customized ArcIMS client. Continue to work with others toward connectivity.

Kentucky: SDE software is installed and running. ArcIMS software is installed, but is presently having technical difficulties working over the network. This problem is being

addressed by survey IT personnel, and is expected to be resolved in the near future. Also, KyGS is investigating the use of “Cold Fusion” software for database/web transfer scripting as alternative to current (slower) MS-ASP software.

Rick Sergeant has converted coal point locations (x, y) and maps to shapefiles for ease of use with SDE (instead of SQL table). Rick has also coordinated with Kurt Look at Kansas and established a network computer account to allow access to Kentucky data files.

Technology Transfer – *The development of the MIDCARB atlas is in itself a technology transfer activity, and will be ongoing from project initiation.*

Larry Wickstrom of the Ohio G.S. made a presentation on MIDCARB at the NETL Conference on Carbon Sequestration in Washington, DC on May 14. Representatives from the Geological Surveys in Illinois, Indiana, Kansas and Ohio were in attendance.