Experience from Geologic CO_2 Storage Field Projects
Supported by DOE's Sequestration Program

Background: The U.S. DOE's Sequestration Program began with a small appropriation of $1M in 1997 and has grown to be the largest most comprehensive CCS R&D program in the world. The U.S. DOE's sequestration program has supported a number of projects implementing CO_2 injection in the United States and other countries including, Canada, Algeria, Norway, Australia, and Germany. The program has also been supporting a number of complementary R&D projects investigating the science of storage, simulation, risk assessment, and monitoring the fate of the injected CO_2 in the subsurface.

The program supports a number of field activities in the United States which would be considered small scale <1,000,000 tons of CO_2 injected during the life of the projects (typically 1-4 years). Environmental Assessments have been prepared one of the first small scale injection projects and large scale injection projects injecting more than 1,000,000 tons of CO_2. Most of the small scale projects underwent NEPA review and were granted categorical exclusions (CX). All of these projects were required to receive and operate their facilities according to the U.S. EPA's Underground Injection Control (UIC) permit requirements to protect underground sources of drinking water (USDW). In addition, several of the projects located on state lands in the western United States received a CX only after satisfying the state agencies' requirements to perform historical studies or biological impact assessments before being granted approval to perform surface operations.

Much of the information on these other projects is located in the 2010 Sequestration Project Portfolio. Additional scientific reports from the projects are available through the OSTI website.

Frio Brine Field Test:

The Frio Brine Sequestration Project was the first field project in the United States to inject CO_2 into a saline formation for the sole purpose of CO_2 storage. The project injected approximately 5,000 tonnes of CO_2 over two separate time periods (~2 weeks each) into the deep saline Frio formation in Texas. Crosswell seismic and tracers with U-tube fluid sampling were the primary methods used to measure, monitor, and validate the research team's predictions of the fate of the injected CO_2. The results of this project also showed that the CO_2 would remain in the target formation and would be contained by the cap rock. The project was permitted under the Underground Injection Control (UIC) Program, with a Class I non-hazardous injection well permit. An Environmental Assessment was prepared and FONSI issued for this project prior to field operations. Additional information on the Frio project is available at:
http://www.netl.doe.gov/publications/others/nepa/ea.html

Small Scale Field Tests - Regional Carbon Sequestration Partnerships Phase II:

The U.S. DOE has been supporting the implementation of 20 small scale projects (<700,000 tones) through the Regional Carbon Sequestration Partnerships (RCSP) Initiative. These projects began in 2005 and are focused on understanding the science behind CCS in different regions of the country, geologic settings (injection zones, caprocks, fluids, and diagenetic processes), and determining the fate of the injected CO_2 in the subsurface. The projects include storage in (tons injected at each site):

- 5 unmineable coal seams (from 100 to 18,000 tons)
- 8 depleted oil fields (from 40 to 637,000 tons), and
- 7 saline formations (from 55 to 60,000 tons).

DOE's involvement in each of these projects depends on the extent of existing CO_2 injection operations at the sites. DOE was providing the various projects with support for well field development, drilling operations, workover of existing wells, simulation modeling, injection operations, monitoring of injected CO_2, injection operations, and closure of the sites. At some of the oil field enhanced recovery sites, the DOE was only providing support for measurement and monitoring efforts. The projects deployed a portfolio of technologies to measure, monitor and verify the fate of the CO_2 in these formations. In all cases, the CO_2 remained in the subsurface with no measureable impacts to the surface water or underground sources of groundwater. Limited disturbance at the surface is necessary to drill new wells, build short spur pipelines, and conduct seismic and other monitoring surveys.

Fifteen (15) of the small scale projects have completed their injection operations in the past four years, two are currently injecting, and one is planning to begin injection operations in November 2010. Similar to the Frio Brine project, these tests have deployed a number of measurement tools, simulation packages, and monitoring protocols to validate that CO_2 remains in the formations developed for storage. A summary of the partnerships' best practices with Monitoring, Verification and Accounting (MVA) is available at: DOE MVA Best Practices Manual

A summary of the Phase II projects and their accomplishments is provided in **Attachment 1 (PhaseIIProjects.xls)**. Project details for each site are also located in 2010 Sequestration Project Portfolio and through OSTI website.

The partnerships are required to present to DOE the results of their injection projects at an annual review meeting. Each project is required to develop a summary of project activities and to present project findings during the meeting. From these reviews, it is evident that the projects have been successful in being able to validate that the CO_2 is safely injected and stored in these deep geologic formations. Presentations and factsheets from each review can be viewed by clicking on each of the following years: 2006, 2007, 2008, 2009.

Large-Scale Field Tests - Regional Carbon Sequestration Partnerships Phase III:

Nine large-scale (>1,000,000 tones) CO_2 injection projects through the Regional Carbon Sequestration Partnerships are in various stages of development and environmental review. Eight projects are injecting CO_2 in deep saline formations and one will be conducting extensive MVA activities at a depleted oil field to determine the fate of the injected CO_2. Field activities for these projects are very similar to the small-scale field projects, but at a larger scale. Two of the large-scale projects have completed Environmental Assessments, which resulted in FONSIs, and one of these projects has currently injected more than 1 million tones of CO_2 in a saline formation. A summary of the Phase III projects and their accomplishments is provided in **Attachment 2 (PhaseIIIProjects.xls)**. Project details for each site are also located in the 2010 Sequestration Project Portfolio and at the 2009 RCSP review meeting proceedings.

International Field Tests:

DOE also supports several activities through National Laboratories and other research institutions that are providing support to monitoring and simulation activities for several international carbon sequestration projects. These projects are all considered near commercial-scale integrated CCS Operations, which are injecting at least 1MMT of CO_2 each year for either enhanced oil recovery or storage in saline formations. The Sleipner and Weyburn projects have both been operating for more than 10 years without incident. Over 30 million tons of CO_2 have been stored at these projects sites combined. Our collaborative efforts with these and other international projects (e.g., Snohvit, In-Salah, and Otway) have provided decades of cumulative operational experience to show that CCS is a safe and effective technology to reduce CO_2 emissions to the atmosphere.

Test Number	RP	Test Name	Project Goals	Vendors/Utilities/Other	Formation Type	Test Site	Source of CO_2	Geologic Province	Geologic Setting	Amt Scheduled for Injection metric tonnes (short tons)	Amt Injection metric tonnes (short tons)	Injection Scheduled Begin (Month/Yr)	Injection Completed (Month/Yr)	EPA UIC Permit	Outcomes of Project
1	Big Sky	Basalt and Mafic Rock Field Validation Test	• Assess basalt formation and adjacent formation response to injection • Validate CO_2 dispersion, dissolution, and trapping in basalt formations • Verify mineralization reactions with post- injection core sampling	• Pacific Northwest National Lab • Idaho State University • Idaho National Lab • Boise White Paper, L.L.C. • Shell Oil Company • Port of Walla Walla • Battelle/General Electric	Saline (basalt/mafic)	Walulla Township, WA	Commercial Source	Columbia River Basalt Group	Grande Ronde Basalt Formation	1,000 (1,100 tons)	0 (2010 Injection)	2010 - Q2	2010 - Q3	V	3-D Seismic survey conducted and test well drilled. No faults identified. Reservoir and seal formations identified. Characterization well drilled and completed April 2009. Target injection formation identified at 2,720 feet. Injection planned for November 2010.
2	MRCSP	Appalachian Basin Geologic Test	• Feasibility/safety of saline formation storage • Characterization of regional saline storage opportunities • Information gained rock properties and formation behavior in region • Establish familiarity with CO_2 injection operations at active power plants	• Ohio Geological Survey • Ohio Dept. of Natural Resources	Saline	Shadyside, OH	Commercial Source	Appalachian Basin	Oriskany, Salina, and Clinton Sandstone	1,000 (1,100 tons)	<50 (55 tons)	2008 - Q3	2008 - Q4	V	Site characterization and 2-D seismic survey performed. Well drilled to just over 8,300 feet. Injection difficulty due to extremely low porosity and permeability in target formations.
3	MRCSP	Cincinnati Arch Geologic Test	• Inject at bottom of Mt. Simon Formation and track CO_2 migration upwards • Feasibility/safety of saline formation storage • Regional characterization of saline storage opportunities • Demonstration of CO_2 capture from coal-fired power plant source	• Kentucky Geologic Survey • Indiana Geologic Survey • Duke Energy	Saline	Rabbit Hash, KY	Commercial Source	Cincinatti Arch	Mt. Simon Sandstone	1,000 (1,100 tons)	1,000 (1,100 tons)	2009 - Q3	2009 - Q3	V	Successful completion of 1,000 tons of CO_2 at depths between 3,200 and 3,600. Post-injection MVA occurring for two years to ensure CO_2 does not migrate to drinking water. Predictive modeling indicates no leakage above the Eau Clair caprock layer.
4	MRCSP	Michigan Basin Geologic Test	• Feasibility/safety of saline formation storage • Regional characterization of saline storage opportunities • Assess feasibility of possible CO_2 CCS from nearby gas processing plants	• DTE Energy • Core Energy, L.L.C. • Western Michigan Univiersity	Saline	Ostego County, MI	DTE Turtle Lake Gas Plant	Michigan Basin	Bass Islands Dolomite	10,000-30,000 (11,023 - 33,069 tons)	60,000 (66,000 tons)	2008 - Q3	2009 - Q3	V	Initial injection of 11,000 tons of CO_2 completed in March 2008. An additional 55,000 tons of CO_2 has been injected by July 2009. Post-injection monitoring included including a combination of cross-well seismic, hydraulic monitoring, PFT tracers, microseismic array, and wireline logging, and made publically available.
5	MGSC	CO_2 Single Well Injection/Soak/Produce Test	• Inject CO_2 into single producing well [huff] • Allow CO_2 to dissipate/dissolve [soak] • Measure the response [puff] • Feasibility/safety of EOR sequestration in mature oil fields	• Air Liquide • Petco Petroleum Corporation	Oil Bearing - Heavy	Fayette County, IL	Commercial Source-Air Liquide	Loudon Oil Field	Mississippi Weiler Sandstone	272 (300 tons)	39 (43 tons)	2007 - Q2	2007 - Q2	II	Injection of 43 tons of CO_2 in the gas phase resulted in 93 barrels of oil produced.
7	MGSC	Enhanced Coalbed Methane	• Feasibility/safety of coal seam sequestration • Changes in CO_2 injectivity of Illinois Coal • Measurement of methane displaced by CQ • Measure amount of CO_2 retained in the coal seam	• Gallagher Drilling Company • Air Liquide	Coal Seam	Wabash County, IL	Commercial Source-Air Liquide	Illinois Basin	Pennsylvania Carbondale Formation	680 (750 tons)	91 (100 tons)	2008 - Q3	2008 - Q4	II	100 tons of CO_2 had been injected into the Pennsylvania Carbondale formation at a rate of 2-3 tons per day. Methane gas production was noted at the face and butt cleat monitoring wells, and CQ was observed at all monitoring wells.
8	MGSC	Oil-bearing Well Conversion	• Employ advanced MVA protocol to understand sequestration potential • Understand EOR/Sequestration options in a complex reservoir	• Gallagher Drilling Company • Air Liquide	Oil Bearing	Hopkins County, KY	Commercial Source-Air Liquide	Sugar Creek Oil Field	Jackson Sandstone	7,272 (8,000 tons)	5,850 (6,448 tons) injecting	2009 - Q3	2010 - Q2	II	Injection began in July 2009 into a converted water flood well. Current rate of injection is about 25 tons CO_2 per day. CO_2 breakthrough at two production wells occurred sooner than expected and therefore an in-fill well will be drilled to understand the formation characteristics of the reservoir, which will improve the reservoir mode
9	MGSC	Oil-bearing Pattern Flood	• Employ advanced MVA protocol to understand sequestration potential • Understand EOR/Sequestration options in a complex reservoir	• Gallagher Drilling Company • Air Liquide	Oil Bearing	Posey County, IN	Commercial Source-Air Liquide	Mumford Hills Oil Field - Bald Unit	Clore Formation	5,454 - 7,272 (6,000 - 8,000 tons)	2,850 (3,590 tons) injecting	2009 - Q4	2010 - Q3	II	Injection began in September 2009 into a converted production well forming an inverted 5-spot configuration. Current rate of injection is about 35 tons CQ per day. Injection anticipated for 6 - 8 months followed by 3 - 5 months of water injection.
10	PCOR	Williston Basin EOR Field Test	• Evaluate use of CO2 for EOR in a deep (>8000 ft) carbonate reservoir • Test geophysical technologies to monitor CO2 in deep carbonate reservoir • Determine the potential for deep carbonate rocks to permanently sequester CQ	• ND Oil & Gas Research Council • ND Dept. of Mineral Resources • Eagle Operating, Inc. • Schlumberger • Praxair	Oil Bearing	Western North Dakota	Commercial	Williston Basin	Mississippian Mission Canyon Formation	4536 (5,000 tons)	400 (440 tons)	2009 - Q3	2009 - Q3	II	CO_2 was injected into an oil-bearing zone at 8,050 feet. The activity will be used to determine the efficacy of CO_2 sequestration and the use of CQ to produce additional oil from other deep carbonate source rocks. Results of the RST and VSP indicated that the CQmigrated approximately 300 ft (90 m) horizontally and 50 ft (15 m) vertically into the reservoir and suggest that the RST and VSP technologies may be effective MVA tools for deep carbonate reservoirs.
11	PCOR	Zama Field Validation Test	• Predict, monitor, and evaluate fate of the injected acid gas • Determine effect of H_2S on CO_2 sequestration • Best practices manual for the use of H$ with EOR and CO_2 sequestration	• Apache Canada Ltd. • Alberta Energy and Utilities Board • Natural Resources Canada	Oil Bearing	Zama City, Alberta Canada	Zama Gas Plant	Zama Oil Field	Middle Devonian Keg River Formation	208,600 metric tonnes CO_2 72,560 metric tonnes H_2S	25,400 (28,000 tons)	2006 - Q4	2009 - Q4	Canada Acid Gas Permit	Acid gas (approximately 70% CO_2, 30% hydrogen sulfide [H_2S]) from natural gas-processing plants in northern Alberta, Canada, were injected into an oil-producing zone in an underground pinnacle reef structure. 25,000 barrels of produced oil resulted. Results will help to determine the best practices to support sequestration in these geologic structures as well as further our understanding of the effects of H_2S on tertiary oil recovery and CO_2 sequestration.
12	PCOR	Lignite in North Dakota Field Validation Test	• Gauge ECBM production from coal resulting from CQ injection • Employ MVA technologies for ECBM and CO_2 storage in coal • Determine the potential for lignite coal to permanently sequester CQ	• Flatland Exploration Company • ND State Land Department • Eagle Operating, Inc. • Schlumberger • Praxair	Coal Seam	Burke County, ND	Commercial Source - Praxair	Williston Basin	Harmon Coal Fort Union Formation	<907 (1,000 tons)	80 (90 tons)	2009 - Q1	2009 - Q2	II	CO_2 will be injected into unminable lignite seams in northwestern North Dakota. The injected CO_2 is trapped by naturally bonding to the surfaces of the fractured lignite. The injected QO also has the potential to displace methane occupying the coal fractures. This validation test will give valuable information regarding lignite for both CQsequestration and enhanced coalbed methane production. • Indications are that the injected CQmigrates along the path of the coal and was contained within the expected injection zone.
13	SECARB	Saline Reservoir Test	• Test deep saline reservoirs near large, coal-fired power plants • Build geologic and reservoir maps and conduct reservoir simulations • Estimate injectivity, storage capacity, and long-term fate of injected CQ	• Advanced Resources International • EPRI • Southern Company • Denbury • Mississippi Power • Praxair • Schlumberger • Halliburton	Saline	Jackson County, MS	Jackson Dome	Mississippi Gulf Coast	Lower Tuscaloosa Massive Sand Unit	2,720 (3,000 tons)	2,740 (3,020 tons)	2008 - Q4	2008 - Q4	V	Successful injection of 3,020 tons of CQ. Currently, variety of surface and subsurface monitoring tasks are underway to track and model the location and movement of the CQ plume.
14	SECARB	Black Warrior Basin Project	• Feasibility/safety of CBM reservoir storage • Determine optimal injectivity for ECBM recovery	• Denbury Resources, Inc. • Electric Power Research Institute • El Paso Exploration and Production • Southern Company • Southern Natural Gas • Viginia Tech	Coal Seam	Tuscaloosa County, AL	Jackson Dome	Black Warrior Basin	Multiple Coal Zones of Pottsville Formation	907 (1,000 tons)	360 (397 tons)	2010 - Q2	2010 - Q2	II	Project still undergoing extensive pre-injection site activities, including characterization. Injected expected to begin in April 2010. Injection redesigned to 218 metric tonnes with water injection prior CO2.
15	SECARB	Central Appalachian Basin Test	• Identify areas for CO_2 coal seam sequestration • Expand ECBM production in Central Appalachian Basin	• Marshall Miller & Associates • Advanced Resources International • Geologic Survey of Alabama • Kentucky Geological Survey • Eastern Coal Council • Virginia Tech	Coal Seam	Russell County, VA	Commercial Source	Central Appalachian Basin	Pocahontas and Lee Formations	907 (1,000 tons)	907 (1,000 tons)	2009 - Q1	2009 - Q1	II	Accomplished injection of approximately 1,000 tons (907 metric tons) of CQ from January 15, 2009 to February 9, 2009, with monitoring activities at the site continuing. Post-injection monitoring continuing. In addition, technology transfer and outreach program has been initiated that includes a website, publications and numerous technical and non-technical presentations at conferences and workshops.
16	SECARB	Gulf Coast Stacked Storage Project	• Conduct a stacked storage project: EOR and underlying brine formation • Employ advanced MVA protocol to understand sequestration potential	• Schlumberger Carbon Services • Advanced Resources International • Praxair • Denbury Resources • Etergy • Marathon Oil Corporation • Pinnacle Technologies • Southern Company	Oil Bearing	Cranfield, MS	Jackson Dome	Cranfield Oilfield	Tuscaloosa Formation	500,000 (551,150 tons)	637,000 ton at end of April 2009	2008 - Q3	2009 - Q2	II	Injection of CO_2 for EOR initiated in July 2008. Post-injection monitoring activities continuing, including soil gas studies and reservoir modeling.
17	SWP	Aneth Oil Field Test - I	• Conduct large-scale EOR project with CQ sequestration • Employ advanced MVA protocol and reservoir simulation	• Resolute Natural Resources Co. • Navajo Nation Oil and Gas Co.	Oil Bearing	San Juan County, UT	McElmo Dome	Paradox Basin	Deep Creek and Ismay Zones	408,240 - 680,400 (450,000 - 750,000 tons)	630,000 (694,449 tons)	2007 - Q3	2010 - Q1	II	Project accomplishments include baseline and repeat surface fluxes and VSP, assessment of baseline reservoir groundwater (brine) compositions, and testing of reservoir tracer began in July 2007; analyses are ongoing. Monitoring activities continuing.
18	SWP	SACROC EOR Project	• Post-audit modeling of Kinder Morgan injections • Test efficacy of CO_2 subsurface monitoring technologies • Track fate of injected CO_2 at SACROC • CO_2 storage history matched with large-scale MVA at SACROC • Results will aid plans for new CQ EOR injections in nearby Claytonville Field	• KinderMorgan CO_2 Company	Oil Bearing	Snyder, TX	McElmo Dome	Permian Basin	Horseshoe Atoll and Pennsylvanian Reef/Bank Play	86,000 (88,184 tons)	86,000 (88,184 tons)	2008 - Q3	2009 - Q4	II	CO_2 injection in first 2 wells started in September 2008 and injections in the second 2 wells began in November 2008. This test includes a post-audit modeling analysis of injected CQ for EOR over the last 30 years at the SACROC Unit in the Permian Basin of Texas, in addition to intense MVA analyses of ongoing CQ injection at SACROC. Results will be used by Kinder Morgan to define an optimized commercial approach to EOR with sequestration in the Claytonville field, a nearby field with similar geology that has not yet been subjected to CO_2 injection.
19	SWP	San Juan Basin ECBM Test	• Evaluate ECBM production efficiency with concomitant CQ storage efficacy • Identify regulatory gaps for ECBM and CQ sequestration • Develop detailed risk assessment and mitigation plans	• ConocoPhillips • KinderMorgan CO_2 Company	Coal Seam	San Juan Basin	McElmo Dome	San Juan Basin	Upper Cretaceous Fruitland Formation	68,040 (75,000 tons)	16,700 (18,400 tons)	2008 - Q3	2009 - Q3	II	Additional project goals include desalination of produced water from the ECBM pilot and use the water for irrigating a riparian restoration project, forming a combined ECBM/terrestrial sequestration project. Began CQ injection operations during July 2008 and ended in July 2009. A total of approximately 18,400 tons (16,700 metric tons) of CQ was injected. The well has since been plugged and abandoned. Conducting a multi-scale investigation of sealing behavior of the overlying Kirtland shale. Preliminary results show good sealing thus far. The study is yet to be completed.

Test Number	RP	Test Name	Vendors/Utilities/Other	Formation Type	Test Site	Source of CO_2	Geologic Province	Geologic Setting	Amt Scheduled for Injection metric tonnes (short tons)	Amt Injection metric tonnes (short tons)	Injection Scheduled Begin (Month/Yr)	Injection Completed (Month/Yr)	NEPA
1	Big Sky	Large-Volume CO2 Injection on Kevin Dome	• Montana State University • University of Wyoming • Schlumberger • Los Alamos National Laboratory • Lawrence Livermore National Lab	Saline	Northern Montana	Kevin Dome - Natural Source	Madison Formation	Kevin Dome	2,000,000 (2,200,000 tons)	0	2012 - Q4	2015 - Q4	EA Pending
2	MRCSP	Large Scale Geologic Injection Test	• Core Energy	Saline	Otsego County, Michigan	Natural Gas Processing Facility	Michigan Basin	St. Peter Sandstone Bass Islands Dolomite	1,000,000 (1,100,000 tons)	0	2011 - Q4	2015 - Q4	EA Initiatied
3	MGSC	Demonstrating CO2 Storage in the Mount Simon Sandstone of the Illinois Basin	• Archer Daniels Midland	Saline	Decatur, IL	ADM's Ethanol Production Facility	Illinois Basin	Mt. Simon Sandstone	1,000,000 (1,100,000 tons)	0	2011 - Q1	2014 - Q1	EA Complete - FONSI Issued
4	PCOR	Fort Nelson Demonstration - British Columbia, Canada	• British Columbia Ministry of Energy, Mines, and Petroleum Resources • Natural Resources Canada • Spectra Energy	Saline	British Columbia, Canada	Spectra Energy's Fort Nelson Natural Gas Processing Facility	Alberta Basin	Elk Point Formation	6,500,000 (7,150,000 tons)	0	2012 - Q3	2017 - Q4	CX (monitoring activities only)
5	PCOR	Bell Creek Demonstration - southeastern Montana	• Denbury Resources	Oil Bearing	Bell Creek Oil Field	Natural Gas Processing Facility	Powder River Basin - Montana	Cretaceous Muddy Formation	1,500,000 (1,650,000 tons)	0	2013 - Q1	2017 - Q4	NEPA Determination Pending
6	SECARB	Early Test	• Advanced Resources International • EPRI • Denbury Resources, Inc. • Southern Company • Gulf Coast Carbon Center (BEG) • Mississippi State University • Lawrence Berkeley National Lab • Schlumberger Carbon Services • Lawrence Livermore National Lab • Southern Company • QEA • University of Mississippi • U.S. Geological Survey	Saline	Cranfield, MS	Jackson Dome (natural source)	Lower Tuscaloosa	Cranfield Unit	1,500,000 (1,650,000 tons)	~1.4 miilion tons <Amt injected as of end of Agust 2010 based on injection initiated 4/1/09>	2009 - Q2	2011 - Q3	EA Complete - FONSI Issued
7	SECARB	Anthropogenic Test	• Advanced Resources International • EPRI • Denbury Resources, Inc. • Southern Company • Gulf Coast Carbon Center (BEG) • Mississippi State University • Lawrence Berkeley National Lab • Schlumberger Carbon Services • Lawrence Livermore National Lab • Southern Company • QEA • University of Mississippi • U.S. Geological Survey	Saline	Citronelle, AL	Southern Company's Plant Barry Coal-Fired Power Plant (Bucks, AL)	Paluxy Formation	Citronelle Field	300,000 (330,000 tons)	0	2011	2014	EA Draft in development
8	SWP	Demonstration of Storage in Deep Jurassic/Triassic Formations of the Western U.S.	• Thunderbird Energy Corp. • Pacificorp • Rocky Mountain Power • Southern California Edison • Schlumberger • Baker Hughes	Saline Aquifer	Gordon Creek Field; Edge of Uinta Basin; < 20 miles West of Price, UT; <100 miles southeast of Salt Lake City, UT	Natural CO2	Colorado Plateau	Intermontane Sedimentary Basin	2,600,000 (2,900,000 tons)	0	2012 - Q1	2016 - Q1	
9	WESTCARB	California Development Phase Test	• California Energy Commission • C6 Resources, LLC • Shell Martinez Refinery • Schlumberger Carbon Services • Clean Energy Systems, Inc.	Saline	California	Northern California or Central Valley, CA (Currently downselecting site)	TBD	TBD	TBD	0	2015	TBD	