PROJECT MANAGEMENT PLAN
for
Establishing an Early CO_2 Storage Complex in Kemper County, Mississippi: Project ECO_2S
March 30, 2017

COOPERATIVE AGREEMENT NUMBER

DE-FE0029465

SUBMITTED BY
Southern States Energy Board
6325 Amherst Court
Peachtree Corners, Georgia 30092

PRINCIPAL INVESTIGATOR
Lead Principal Investigator (PI)
Kenneth J. Nemeth, Executive Director
Phone: (770) 242-7712
Fax: (770) 242-9956
Email: nemeth@sseb.org

Co-Principal Investigator, Contact PI/Project Coordinator
Kimberly Sams Gray, Managing Director
Phone: (770) 242-7712
Fax: (770) 242-9956
Email: gray@sseb.org

SUBMITTED TO

U.S. Department of Energy

National Energy Technology Laboratory

A. Executive Summary

The Phase II: Storage Complex Feasibility project, entitled "*Establishing an Early CO_2 Storage Complex in Kemper County, Mississippi: Project ECO_2S,*" will establish a commercial-scale (438 million metric tons of capacity) CO_2 Storage Complex adjacent to the Kemper County energy facility. Further, it is the Project Team's intent to establish this Storage Complex (including completing subsequent Phases III and IV) three years earlier than the proposed year 2025 target date discussed by DOE/NETL for a fully characterized, permitted, and constructed CO_2 Storage Complex able to accept commercial scale CO_2 injection. Three regionally extensive porous and permeable saline formations, with thick confining systems, have been identified at the Storage Complex. The Storage Complex will have the capacity to receive 3 million metric tons per year of CO_2, and potentially three times as much as determined by pre-feasibility models, for a period of at least 30 years.

Project ECO_2S is headed by the Southern States Energy Board (SSEB). Mississippi Power Company (MPC) will serve as the site host, as well as the primary cost share partner and the source of the CO_2. The project includes technical and field implementation support from Advanced Resources International (ARI) and will obtain analytical support from two national laboratories (Los Alamos and Lawrence Berkeley), a host of universities and other key participants.

Project ECO_2S will pursue key advances in CO_2 storage knowledge and technology, including optimizing CO_2 storage efficiency, modeling the fate of injected CO_2, and establishing residual CO_2 saturations. In addition, Project ECO_2S will involve "real-life" experiences, issues, and challenges of scaling-up from its regional, pre-feasibility assessment of CO_2 storage to establishing a site-specific, commercial-scale CO_2 storage facility, including capturing the "lessons learned" in making this transition.

Project ECO_2S supports all four of DOE's Carbon Storage R&D Program objectives. By integrating flow-unit level characterization of three major saline formations with state-of-the-art reservoir modeling, Project ECO_2S will further refine our understanding of CO_2 storage efficiency and containment (DOE Goal #2). By rigorously modeling the areal (and vertical extent) of the CO_2 plume, Project ECO_2S will enhance industry's ability to predict (as well as optimize) CO_2 storage capacity (DOE Goal #3). By engaging in extensive storage site screening and characterization as well as risk analysis (using DOE/NETL developed NRAP tools) and conducting early public outreach, Project ECO_2S will contribute to DOE's Commercial-Scale Best Practices Manuals (DOE Goal #4). Finally, Project ECO_2S will draw on geomechanical modeling by Virginia Polytechnic Institute and State University, the University of Alabama at Birmingham's Caprock Integrity Laboratory, and the DOE/NETL Carbon Storage Program's NRAP tools to ensure 99% storage permanence (DOE Goal #1).

B. Project Organization and Structure

Organizational Charts. SSEB is the overall lead for Project ECO_2S. An organizational chart depicting the contractual flow down to sub-recipients is provided in
Figure 1, and the management organizational chart is provided as Figure 2. The need for two structures arises from a Mississippi Sales and Use Tax for construction contractors. To simplify the accounting and reporting procedure, the best contractual approach is to cluster the sub-recipients into taxable and non-taxable categories. SSEB will issue sub-recipient contracts to Advanced Resources International, Inc. (ARI), Auburn University (AUB), Gerald R Hill PHD, Inc. (Hill), Pashin Geoscience, LLC (Pashin), Trimeric Corporation (Trimeric), the University of Alabama at Birmingham (UAB), and the University of Wyoming (UW). ARI will manage the technical and field operations and will issue sub-recipient contracts to the partners that will provide services in the field that are most likely to incur the Mississippi contractors' tax, including Battelle Memorial Institute (Battelle), Geological Survey of Alabama (GSA), GHG Underground (GHGU), Loudon Technical Services, LLC (Loudon), Mississippi State University's (MSU) Department of Geosciences, Oklahoma State University (OSU), and Virginia Polytechnic Institute and State University (VA Tech). Southern Company Services (SCS) will provide management oversight on behalf of Mississippi Power Company (MPC), a subsidiary of Southern Company, as it relates to the work completed on MPC property but will not receive a formal sub-recipient contract. Lawrence Berkeley National Laboratory (LBNL) and Los Alamos National Laboratory (LANL) are project partners and will conduct work through Field Work Proposal (FWP)

agreements to be approved directly by DOE/NETL. All partners have provided commitment letters offering technical support and/or financial resources to the project.

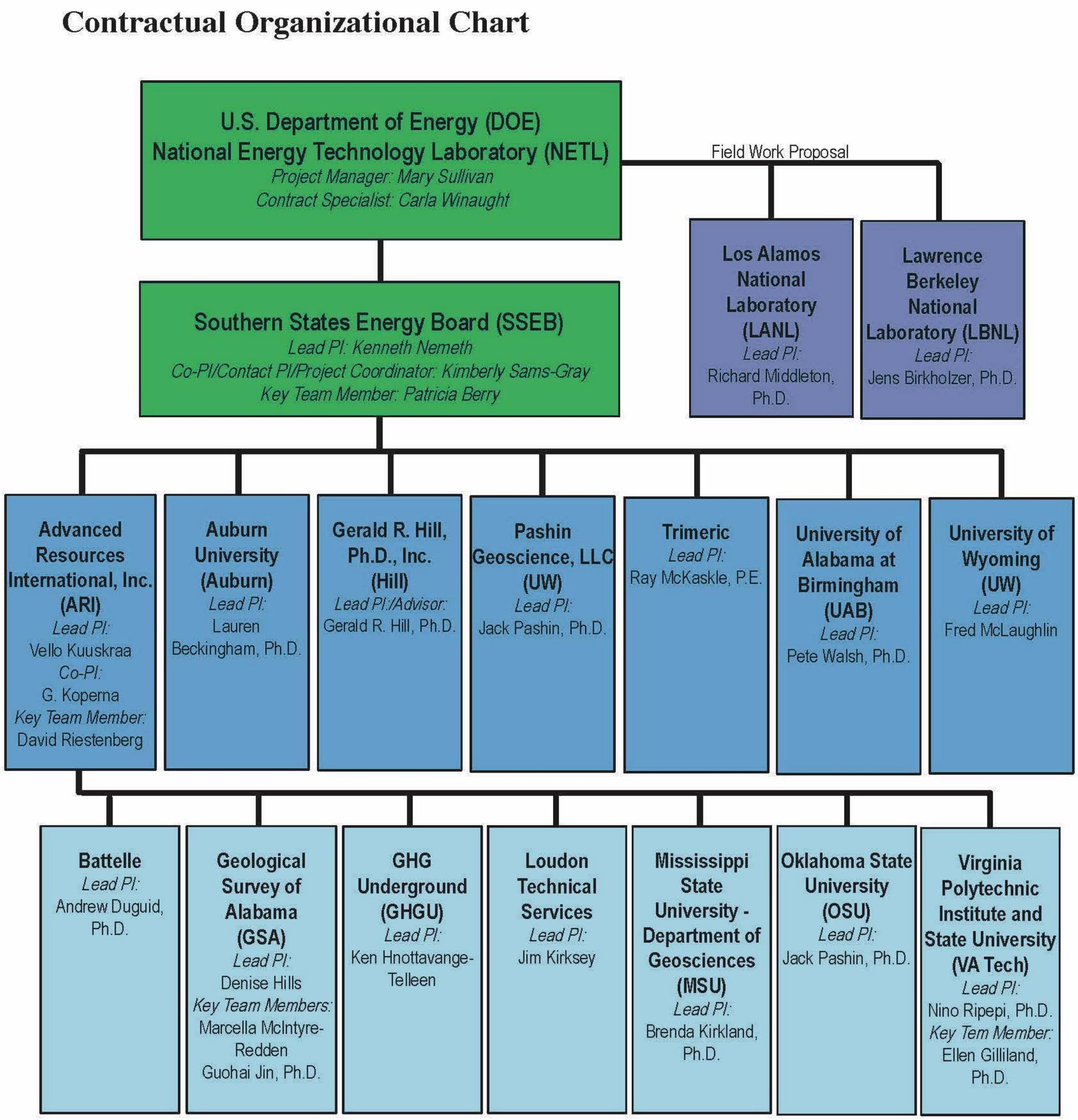

Figure 1. Project ECO_2S contractual organizational chart.

The Project Team's overall management organizational structure facilitates the performance of the tasks and achievement of the objectives described in the Statement of Project Objectives (SOPO) within the specified schedule and budget. Utilizing the successful model of the DOE Regional Carbon Sequestration Partnerships, SSEB has taken a team approach to developing the SOPO. Project ECO_2S is comprised of a partnership of eighteen entities with multiple principal investigators (PIs). **SSEB's Lead PI** and **Co-PI** are responsible for all aspects of project performance in accordance with the DOE/NETL Cooperative Agreement. MPC is the **Project Host** and is providing the Project Team with access to the property. MPC/SCS is not receiving federal funds for their work associated with the project. A **Host Site Project Director** (SCS) is assigned to facilitate communication between MPC and the Project Team and to lead the risk mitigation activities along with the **Risk Assessment and NRAP Partners** (GHGU, LBNL, and LANL). The **Technical/Field Director** (ARI) will contract with and manage the **Technical Partners** (AU, GSA, MSU, Pashin, Trimeric, UAB, UW, and VA Tech) and **Field Partners** (Battelle, Loudon, and OSU) and will provide direct oversight for the geologic characterization, well drilling, and reservoir modeling activities. A **Technical Program Advisor** (HILL) will provide project management support and guidance as it relates to overall management strategies, CCS component integration, and risk assessment. SSEB's **Overall Financial Director** will provide daily support related to all financial and contractual management.

Roles and Responsibilities of Participants. The Project Team is a partnership comprised primarily of organizations and individuals who have collaborated and/or are currently collaborating on CCS projects. To facilitate collaboration, the partners will communicate frequently via individual calls, regularly scheduled conference calls, and web or in-person meetings and also share files and data through a web-based portal. The only necessary business arrangement needed to perform the project, the site access agreement between MPC and ARI, was fully executed in January 2017. There are no intellectual property issues associated with this project. Table 1 identifies senior and key personnel by organization, task assignment, and the roles to be performed by each partner within the context of the Task structure contained in the SOPO.

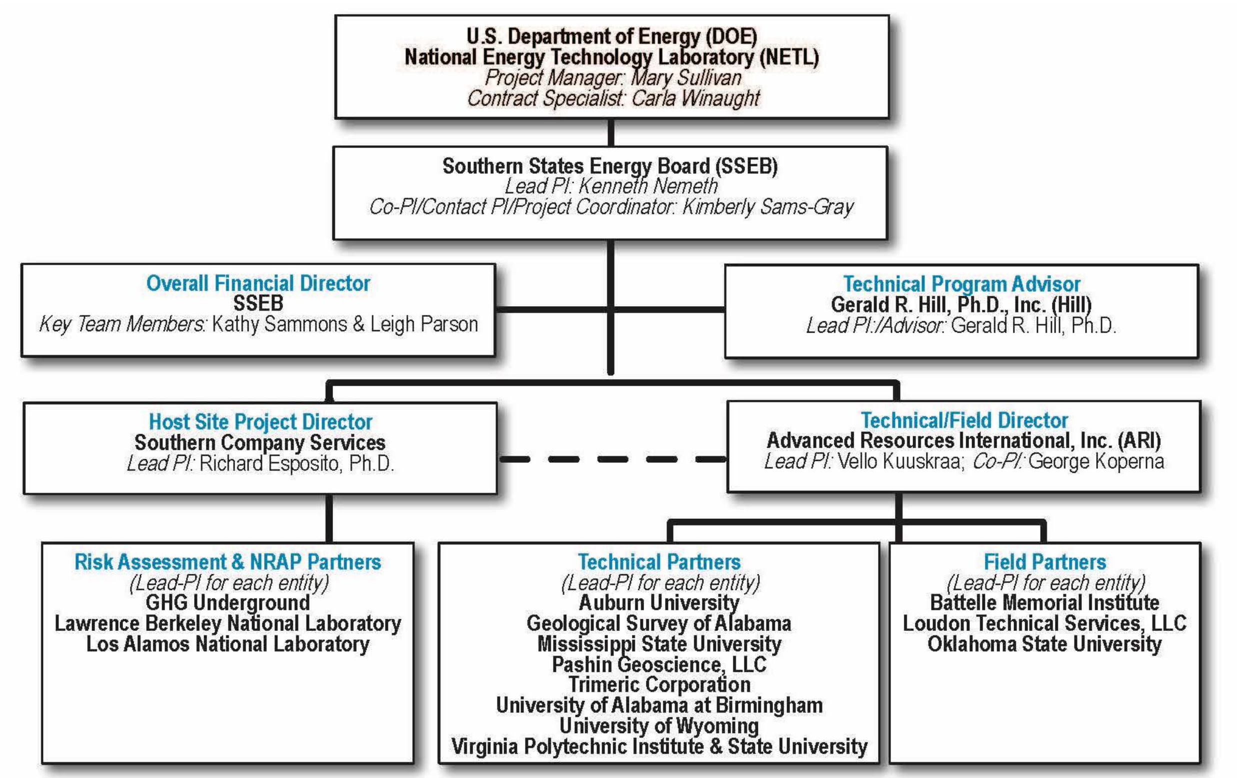

Figure 2. Project ECO_2S management organizational chart.

Table 1. Senior and key personnel by organization, task assignment, and roles to be performed by each partner.

Project Partners	Sr. & Key Personnel	Task(s)	Role
SSEB	Nemeth, Gray, Berry	1,2	PI/Lead organization, project mgmt./admin., outreach, risk
ARI	Kuuskraa, Koperna, Riestenberg	1-8	Lead for technical/field operations, outreach support, risk identification, commercial development planning

AUB	Beckingham	6	Geologic data analysis support
Battelle	Duguid	5	Site selection and well drilling support, engineering design collaboration
GHGU	Hnottavange-Tellen	4	Risk assessment and mitigation
GSA	Hills	4	Site characterization and modeling, geophysics expertise
HILL	Hill	1	Advisor for project management, CCS component integration and engineering, risk analysis
LANL	Middleton	7	Infrastructure development, technoeconomic analysis of CO_2 capture and storage, risk analysis
LBNL	Birkholzer	4	Advisor for model testing in geomechanical simulations and induced seismicity risk assessments, NRAP support
Loudon	Kirksey	5	Site selection and well drilling support, process engineering
MSU	Kirkland	6	Geologic data analysis support
OSU	Pashin	6	Geologic data analysis support
Pashin	Pashin	5	Site selection and well drilling support, geology
SCS-MPC	Esposito	1	Project/Site Host, Outreach, Communication between Project Team and MPC (no contract)
Trimeric	McKaskle	7	Infrastructure development support, surface facilities and pipelines
UAB	Walsh	4, 6	Geologic data analysis support, caprock integrity laboratory analysis, MVA
UW	McLaughlin	6	Geologic data analysis support, advanced characterization in state of the art laboratory
VA Tech	Ripepi, Gilliland	6	Geologic data analysis support

Decision-making and Communication Strategy. The management structure facilitates the performance of the tasks and achievement of the objectives described in the SOPO within the specified time frame and budget. SSEB is ultimately responsible for decision-making on the scientific/technical direction of the Project. Each organization has designated a Lead PI that has the authority/responsibility for the proper conduct of the research, intellectually and logistically, and the technical, financial, and scheduling aspects of the project. Each Lead PI has the authority to provide scientific/technical advice and a decision on behalf of his/her organization. The level of project team involvement and management necessary for decision-making will be determined on a case-by-case basis and at the discretion of the SSEB Contact PI/Project Coordinator (Gray). To arrive at a decision on scientific/technical direction Gray will consult with the SCS Lead PI. As appropriate, SCS will seek advice and input from the Lead/Co-PI of ARI who, in turn, can seek advice/input from the technical and field partners. These decisions will be shared with Gray, and she will make a preliminary decision and obtain final approval on the decision from SSEB's Lead PI, Nemeth, before communicating the decision to DOE/NETL. SSEB's Contact PI/Project Coordinator will keep DOE/NETL informed of the decision-making process and progress as these issues arise.

C. Risk Management

The Host Site Project Director (SCS) will lead a Risk Assessment and NRAP Partners team to identify potential risks associated with the project (Task 4.0). In coordination with the entire Project Team all risks will be identified and evaluated by measuring the severity of potential consequences (relative to health and safety, environmental protection, cost, reputation, and schedule) and their likelihood of occurrence. Each risk will be assigned a responsible party to assume ownership of minimizing and mitigating the risk, along with actions that can be taken and a schedule for their implementation.

Risk Registry

Uncertain Future Event	Risk to Project	Risk Management Method	Risk Level
Management Issues: Reporting and Milestones	Delayed or late reports	Reporting requirements and milestones are manageable and not constrained by any single participant or event. SSEB will manage the project and assist in report preparation to regain any schedule slippage.	Low probability, Low consequence
Cost Share	Cost share not harmonized temporally with federal spend	Cost share requirements will be met early on in the project with immediate drilling of the first well.	Low probability, Low consequence
Environmental, Health, or Safety Issues	Environmental impacts to air, land, and water resources and potential impacts of waste production	The Kemper County energy facility completed the EIS process. Partners are experienced in well drilling and will follow the MPC HSE plan/protocols. Members of the team also will be on-site during well drilling to monitor the field service personnel.	Low probability, Low consequence
Environmental, Health, or Safety Issues	Delay in obtaining Mississippi permits	Draw upon team experience in well permitting and maintain an open dialogue with state and federal regulators.	Low probability, Low consequence
Management Issues: Staff Availability	Delays in completion due to excessive staff workload	Participants are experienced in handling multiple projects. The participating partners and entities have considerable depth in professional staff with related experience.	Low probability, Low consequence
Management Issues: Staff Availability	Key person replacement	Maintain work distribution to ensure that other individuals are prepared and qualified to assume responsibilities.	Low probability, Medium consequence
Management Issues: Staff Availability	Delays in approving Foreign Nationals access	Pre-screen potential project partners and team members and provide necessary credentials to NETL for approval.	Medium probability, Low consequence
Technical Difficulties	Unforeseen issues with well drilling and completion	Draw upon team experience to identify issues and secure equipment and professionals to address issues.	Low probability, Medium consequence
Resource Availability	Availability of drilling, workover, and well support equipment and technical field crews	Draw upon team experience to obtain early bids/commitments.	Low probability, Medium consequence
Site Access Issues for Field Work	Site access is necessary to perform the project	MPC will host the Project and provide reasonable site access to its property. As of the proposal date, the agreement is near final and no issues are anticipated.	Low probability, High consequence
Storage Reservoir	Lack of suitable storage reservoirs	The Project Team will consider geology along CO_2 pipeline or engineered storage.	Low probability, High consequence
Pore Space Ownership	No CO_2 storage complex or the need for an alternate site	The MPC Real Estate Department has successfully acquired surface and pore space rights for both the Plant and the associated lignite mine.	Low probability, Medium consequence

D. Schedule, Labor and Cost Baselines:

Baseline Schedule/Timeline. Project ECO_2S will be conducted over a two-year (24-month) performance period divided into two 12-month budget periods. The following Gantt chart provides a schedule of the project broken down by Task and Subtask as described in the Statement of Project Objectives. The chart also indicates the start date and end date for each Task/Subtask and identifies all deliverables, milestones, and decision points as identified in Section F (Project Milestones) of the PMP. Task 1.0, Project Management and Planning, and Task 2.0, Outreach, will be active throughout the entire performance period. Task 3.0 will entail the completion and approval of all Permitting and Site Access Agreements. Task 4.0 involves all Site Characterization and Modeling activities that set the foundation for Task 5.0, Site Selection and Well Drilling. Comprehensive Geologic Data Analysis will be conducted under Task 6.0 using data collected under Tasks 4.0 and 5.0. Infrastructure development is the focus of Task 7. Task 8.0 provides for the development of a Commercial Development Plan to be based on the regional geologic framework created under Task 6.0 and findings from all aspects of the project.

PROJECT ECO2S	KEY ◆ Milestone		Budget Period 1 3/1/17-2/28/18				Budget Period 2 3/1/18-2/28/19			
Task Description	Start	End	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task 1.0: Project Management and Planning	**3/1/17**	**2/28/19**								
Subtask 1.1: Overall Proj. Mgmt., Planning, Communication	3/1/17	2/28/19		◆ Kickoff Meeting						
Subtask 1.2: Project Management Plan	3/1/17	2/28/19	◆ PMP							
Subtask 1.3: Data Management Plan	3/1/17	2/28/19								
Task 2.0: Outreach	**3/1/17**	**2/28/19**								
Subtask 2.1: Community Outreach and Education	3/1/17	2/28/19								
Subtask 2.2: Regulatory Outreach	3/1/17	2/28/19								
Subtask 2.3: Knowledge Sharing	3/1/17	2/28/19								
Task 3.0: Permitting and Site-Access Agreements	**3/1/17**	**8/31/17**								
Subtask 3.1: NEPA Assessment	3/1/17	8/31/17								
Subtask 3.2: Contractual	3/1/17	8/31/17								
Subtask 3.3: Permitting and Site Survey	3/1/17	8/31/17								
Task 4.0: Site Characterization and Modeling	**3/1/17**	**2/28/19**								
Subtask 4.1: Assessment of Existing Subsurface Data	3/1/17	12/31/17								
Subtask 4.2: Surface Seismic Surveys	3/1/17	5/31/18								
Subtask 4.3: Surface Characterization	3/1/17	12/31/17								
Subtask 4.4: Reservoir Modeling	3/1/17	8/31/17								
Subtask 4.5: Risk Assessment	3/1/17	2/28/19					◆ Initial Risk Assessment			
Subtask 4.6: Risk Assessment Tools	9/1/17	2/28/19								
Subtask 4.7: Collaboration and Data Collection	3/1/17	2/28/19								
Task 5.0: Site Selection and Well Drilling	**3/1/17**	**8/31/18**								
Subask 5.1: Well Site Selection	3/1/17	12/31/17								
Subtask 5.2: Well Design	3/1/17	12/31/17								
Subtask 5.3: Well Drilling and Geologic Data Collection	11/1/17	8/31/18								
Task 6.0: Geologic Data Analysis	**3/1/17**	**2/28/19**								
Subtask 6.1: Core Analysis	3/1/17	2/28/19								
Subtask 6.2: Refined Geologic Model	3/1/17	1/31/19							Geologic Framework ◆	
Subtask 6.3: Reactive Transport Simulations	3/1/17	1/31/19								
Subtask 6.4: Thermo-Hydro-Mechanical (THM) Modeling	3/1/17	1/31/19								
Task 7.0: Infrastructure Development	**8/1/17**	**1/31/19**								
Subtask 7.1: Site Infrastructure Development	8/1/17	1/31/19								
Subtask 7.2: Regional Infrastructure Development	8/1/17	1/31/19								
Task 8.0: Commercial Development Plan	**3/1/18**	**2/28/19**								
Subtask 8.1: Numerical Modeling of CO2 Flow and Storage	3/1/18	1/31/19								
Subtask 8.2: Commercial Development Plan	12/1/18	2/28/19						Commercial Development Plan ◆		

Baseline Labor Effort by Task. The Project Team is comprised of individuals with very specialized skills and CCS project development expertise that are required to achieve the project goals. The partners represent 18 organizations with multiple PIs, Co-PIs, professors, engineers, scientists, geologists, research assistants, IT technicians, administrative personnel, and graduate and undergraduate students. The Lead PIs and the Co-PIs have the authority and responsibility for the proper conduct of the research, intellectually and logistically, and the technical and financial aspects of the project. The PIs are experienced in conducting complex Federally-funded projects, either as a PI or senior key personnel. These individuals will ensure that the project meets or exceeds all administrative, technical, and scientific, and financial objectives. The PIs will provide the required personnel, facilities, equipment, supplies, and services necessary to carry out the SOPO as delineated in the most current Cooperative Agreement/Modification by utilizing the approved PMP. Labor hour distributions for personnel are based on experience managing similar programs and historical costs related to those projects.

Baseline Labor Effort by Task

Labor Categories	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Total
1. Principal Investigator/Contact PI	1708	784	96	136	1222	1652	120	204	5922
2. Co-PI/Project Manager/Professor	104	280	96	188	432	3387	363	132	4982
3. Engineer	648	630		852			112	260	2502
4. Scientist/Geologist	2044	860	140	689	1123	678	38	328	5900
5. Research Assistant	664	160	80	1012	1808	1520		226	5470
6. IT Technician						960			960
7. Administrative/Financial	1184	32	60	224	380	40		160	2080
8. Grad & Undergrad Student						20143			20143
Total Hours Per Task/Category	**6352**	**2746**	**472**	**3101**	**4965**	**28380**	**633**	**1310**	**47959**

Baseline Project Cost by Task

Task Breakdown	BP1-Fed Share	BP1-Cost Share	BP1-TOTAL	BP2-Fed Share	BP2-Cost Share	BP2 TOTAL	TOTAL Fed Share	Total Cost Share	Total Budget
Task 1.0 - Project Management and Planning	$458,799	$8,985	$467,784	$353,299	$88,324	$441,623	$812,098	$97,309	$909,407
Task 2.0 - Outreach	$220,635	$0	$220,635	$216,082	$54,020	$270,102	$436,718	$54,020	$490,738
Task 3.0 - Permitting & Site Access Agreements	$85,821	$0	$85,821	$0	$0	$0	$85,821	$0	$85,821
Task 4.0 - Site Characterization & Modeling	$442,726	$16,089	$458,815	$193,368	$52,036	$245,404	$636,094	$68,125	$704,219
Task 5.0 - Site Selection & Well Drilling	$7,057,499	$3,153,054	$10,210,553	$162,212	$40,555	$202,767	$7,219,711	$3,193,609	$10,413,320
Task 6.0 -Geologic Data Analysis	$1,063,745	$102,047	$1,165,792	$656,414	$163,548	$819,962	$1,720,159	$265,595	$1,985,754
Task 7.0 - Infrastructure Development	$63,855	$0	$63,855	$80,512	$20,128	$100,640	$144,367	$20,128	$164,495
Task 8.0 - Commercial Development Plan	$0	$0	$0	$165,570	$41,393	$206,963	$165,570	$41,393	$206,963
Total	$9,393,080	$3,280,175	$12,673,255	$1,827,457	$460,004	$2,287,461	$11,220,537	$3,740,179	$14,960,716

E. Baseline Funding Profiles

Baseline Funding Profiles are provided below by Budget Period and Recipient Organization, by Funding Source and DOE Funding by FY Quarter.

Baseline Funding Profile by Budget Period and Recipient Organization

	Budget Period 1		Budget Period 2		TOTAL		
Recipient Organiza	**DOE Funds**	**Non-Federal Cost Share**	**DOE Funds**	**Non-Federal Cost Share**	**DOE Funds**	**Non-Federal Cost Share**	**Total Costs**
SSEB	$ 432,326	$ -	$ 439,550	$ -	$ 871,876	$ -	$ 871,876
Advanced Resources Int. (includes Subs)	$ 11,296,360	$ 45,402	$1,342,182	$ 46,542	$ 12,638,542	$ 91,944	$ 12,730,486
Auburn University	$ 124,999	$ 13,889	$ 124,999	$ 13,889	$ 249,998	$ 27,778	$ 277,776
Gerald R Hill	$ 35,943	$ 8,985	$ 37,786	$ 9,446	$ 73,729	$ 18,431	$ 92,160
Pashin Geoscience LLC	$ 54,564	$ -	$ -	$ -	$ 54,564	$ -	$ 54,564
Trimeric	$ 13,856	$ -	$ 39,644	$ -	$ 53,500	$ -	$ 53,500
University of Alabama-Birmingham	$ 90,001	$ 6,250	$ 34,999	$ 6,250	$ 125,000	$ 12,500	$ 137,500
University of Wyoming	$ 384,005	$ 52,595	$ 81,254	$ -	$ 465,259	$ 52,595	$ 517,854
Los Alamos National Lab	$ 49,999	$ -	$ 50,001	$ -	$ 100,000	$ -	$ 100,000
Lawrence Berkeley National Lab	$ 64,081	$ -	$ 60,919	$ -	$ 125,000	$ -	$ 125,000
MS Power Company	$ (3,153,054)	$3,153,054	$ (383,877)	$ 383,877	$ (3,536,931)	$ 3,536,931	$ -
Total	**$ 9,393,080**	**$3,280,175**	**$1,827,457**	**$ 460,004**	**$ 11,220,537**	**$ 3,740,179**	**$ 14,960,716**

Baseline Funding Profile by Funding Source

Funding Source	Type	Budget Period 1	Budget Period 2	Total
DOE	Cash	$9,380,520	$1,840,017	$11,220,537
SSEB				$-
Advanced Resources Int. (includes subs)	Inkind	$45,402	$46,542	$91,944
Auburn University	Inkind	$13,889	$13,889	$27,778
Gerald R Hill	Inkind	$8,985	$9,446	$18,431
University of Alabama-Birmingham	Inkind	$6,250	$6,250	$12,500
University of Wyoming	Inkind	$52,595		$52,595
Mississippi Power Company	Cash	$3,153,054	$383,877	$3,536,931
Total		**$12,673,255**	**$2,287,461**	**$14,960,716**

DOE Funding by FY Quarter

	FY 2017 ($)	FY 2018 ($)
CYQ1 (Jan-Mar)	$7,712,890	$456,864
CYQ2 (Apr-June)	$822,368	$456,864
CYQ3 (Jul-Sep)	$500,000	$456,864
CYQ4 (Oct-Dec)	$357,822	$456,864
Total By FFY	$9,393,080	$1,827,457

Spend Plan by Month

	FY 2017 ($)	FY 2018 ($)	FY 2019 ($)
January		$550,000	$190,621
February		$475,000	$190,620
March	$200,000	$475,000	
April	$200,000	$450,000	
May	$2,000,000	$428,428	
June	$1,000,000	$400,000	
July	$300,000	$325,000	
August	$300,000	$300,000	
September	$3,000,000	$225,000	
October	$2,911,048	$200,000	
November	$400,000	$100,000	
December	$250,000	$90,000	

E. Project Milestones

The following table provides a list of project milestones. The milestones are quantitative and indicate progress toward accomplishing the project goals and will be reported as part of the required progress report.

Task	Milestone Title	Planned Completion Date (Actual Dates in Bold)	Verification Method
1.0	Participate in Project Kickoff Meeting	**3/15/17**	Attendance at Meeting; Presentation File
1.0	Implement Project Management Plan	**3/30/2017**	File to be provided to DOE (WP 1.2)
4.0	Complete Initial Risk Assessment	2/28/17	Letter from SSEB to DOE documenting findings of initial risk assessment
6.0	Complete Geologic Framework	1/31/19	File to be provided to DOE (WP 6.2.b)
8.0	Complete Commercial Development Plan	2/28/19	File to be provided to DOE (WP 8.2)

F. Decision Points and Success Criteria

The following decision points and success criteria will be encountered during the course of the project, including go/no-go decision points, and describes criteria that will be used to define “success” at each decision point.

Decision Point	Success Criteria	Description	Criteria to Define Success & Importance
✓	✓	**Negotiation/Implementation of PMP** *Go/No-Go Decision Point 1 (Reference Deliverable 1.2)*	SSEB will revise the PMP by including details from the negotiation process. The PMP will be updated to incorporate any changes in project management, schedule, and/or budget. DOE/NETL’s approval of this plan and its implementation is necessary to carry out the stated goals of the project and budget objectives.

✓	✓	**Negotiation/Implementation of Phase II** Go/No-Go Decision Point 2	A continuation application will be prepared and submitted to DOE/NETL for approval of BP2. Success will be measured by DOE/NETL's approval of the continuation application and concurrence that the project is meeting its objectives on schedule and within budget.

G. Statement of Project Objectives

Statement of Project Objectives

Establishing an Early CO_2 Storage Complex in Kemper County, Mississippi: Project ECO_2S

OBJECTIVES

The project, "*Establishing an Early CO_2 Storage Complex in Kemper County, Mississippi: Project ECO_2S,"* will demonstrate that the subsurface adjacent to the Kemper County energy facility has the potential to store commercial volumes of CO_2 safely, permanently, and economically within a regionally significant saline reservoir system. To meet this objective, the Recipient in collaboration with its project team will characterize and refine its understanding of the subsurface geology through the installation of new wells and the use of numerical models. The recipient in collaboration with its project team also will refine the preliminary estimates for the optimum CO_2 storage capacity of the Storage Complex. Finally, the recipient in collaboration with its project team will develop robust monitoring plans specific to the site, identify the contractual and regulatory pathways necessary to develop this significant storage site, and assess project risks. The research will allow for the following objectives to be met:

Budget Period 1

Objective 1: Fulfill requirements needed to commence initial characterization of the Storage Complex

Objective 2. Establish a public outreach strategy for Project ECO_2S

Objective 3. Complete an initial risk assessment of the Storage Complex

Budget Period 2

Objective 1. Demonstrate that the subsurface at the Storage Complex can store commercial volumes of CO_2 safely and permanently within the saline reservoir system

Objective 2. Establish and optimize the CO_2 storage capacity of the Storage Complex including the areal extent of the CO_2 plume

Objective 3. Confirm the viability of the reservoir seals to serve as a long-term, reliable confining system for the CO_2 storage site, perform an analysis of rock mechanics, and employ geomechanical modeling to define the potential for inducing seismicity at the CO_2 storage site

Objective 4. Complete a comprehensive risk assessment utilizing reservoir modeling and the NETL-sponsored integrated assessment model

Objective 5. Define a comprehensive CO_2 Monitoring, Verification and Accounting (MVA) system

Objective 6. Deliver detailed plans for subsequent site characterization (Phase III) and permitting and construction (Phase IV)

SCOPE OF WORK

To determine the feasibility of the storage complex and meet the project objectives, the work effort will include:

Budget Period 1

- Finalize all contractual agreements between ECO_2S Project Partners and hold a Project Team kickoff meeting to initiate project activities and communication.
- Ensure National Environmental Policy Act (NEPA) compliance, negotiate site access and work agreements and obtain well drilling and completion permits.

Budget Period 1 & 2

- Present Project ECO_2S activities at conferences, workshops, and/or other technical sessions to update various stakeholders on the status, progress, results, findings, and other topics related to carbon capture and storage (CCS).
- Design, conduct and report on the risks associated with this project and potential subsequent development of the storage complex.
- Drill three characterization wells that will be permitted as monitoring wells and will be completed to Underground Injection Control (UIC) Class VI standards for later use at the storage site for monitoring purposes.
- Assess available subsurface data and newly obtained data and integrate these analyses into an updated geologic model.

Budget Period 2

- Define a comprehensive CO_2 monitoring system for the Storage Complex and craft a "quick response" contingency plan should the monitoring system signal the onset of CO_2 leakage.
- Assemble a Commercial Development Plan to support accelerated, future site development.

TASKS TO BE PERFORMED

Task 1.0 – Project Management and Planning (Budget Periods 1 and 2). This Task includes the necessary activities to ensure coordination and planning of the project with DOE/NETL and other project participants. These activities include, but are not limited to, the monitoring and controlling of project scope, cost, schedule, and risk, and the submission and approval of required NEPA documentation. This Task also includes all work elements required to maintain and revise the Project Management Plan (PMP), and to manage and report on activities in accordance with the plan, including all work elements required to maintain and revise the Data Management Plan (DMP).

Subtask 1.1 – Overall Project Management, Planning, and Communication. The Recipient will monitor and track the project's progress and provide briefings to DOE/NETL. Data generated as a result of this project will be submitted to NETL-EDX. The Contact PI/Project Coordinator will inform the DOE/NETL Project Officer of project successes and any issues that arise during the course of the project that may affect the technical, schedule, and/or budget objectives.

Subtask 1.2 – Project Management Plan. The Recipient will be responsible for maintaining and revising the PMP and for managing and reporting on activities in accordance with the plan. The PMP will be revised and submitted to DOE/NETL upon award, as part of the Budget Period 2 continuation application, and throughout the performance period as management modifications are needed. The PMP contains, at a minimum, details regarding the project organization and structure; risk management; schedule, labor, and cost baselines; baseline funding profiles; project milestones; and decision points and success criteria. The PMP includes a table of current and active risks that will be managed and mitigated throughout the performance period.

Subtask 1.3 – Data Management Plan. A DMP will be implemented as prescribed. The DMP explains how data generated during the course of the work performed under this award will be shared and preserved or, when justified, explains why data sharing or preservation is not possible or scientifically appropriate.

A catalog of geologic materials/samples collected under the project must be developed and maintained throughout the project. Throughout the life of the project, the Recipient must provide DOE to physical access to available materials/samples upon request ensuring this request does not impede ongoing or planned investigations. If the Recipient does not wish to retain the materials/samples, then the Recipient must offer DOE the opportunity to obtain possession of available materials/samples before the materials/samples are disposed.

Task 2.0 – Outreach (Budget Periods 1 and 2). The Recipient's approach to outreach will serve as a model for promoting stakeholder acceptance and deployment of CCS throughout the Southeast.

Subtask 2.1 – Community Outreach and Education. Community outreach and education will be performed as needed, related to activities at the Storage Complex.

Subtask 2.2 – Regulatory Outreach. The Recipient in collaboration with its project team will inform the appropriate state regulatory agencies regarding the objectives of this project.

Subtask 2.3 – Knowledge Sharing through Conferences, Workshops, and Technical Papers. This subtask provides a dedicated mechanism for sharing and communicating data and research results to the Recipient's board (primarily governors, legislators, and state government officials from 18 member jurisdictions) and associate members (industry partners), industry, and other members of the CCS community. Through the Recipient's association with the Southeast Regional Carbon Sequestration Partnership, the Recipient in collaboration with its project team also will promote information exchange and knowledge sharing through various avenues, including the Regional Carbon Sequestration Partnerships' working groups. Presentations at conferences, workshops, and other technical sessions will be held to update various stakeholders on the status, progress, results, findings, and other topics related to CCS.

Task 3.0 – Permitting and Site-Access Agreements (Budget Period 1). The purpose of this Task is to ensure that National Environmental Policy Act (NEPA) requirements are met and that valid federal, state, and local permits are attained. The Project Team will satisfy all local, state and federal permitting requirements to conduct the project, including environmental, transportation, and storage monitoring.

Subtask 3.1 – National Environmental Policy Act (NEPA) Assessment. The Recipient will supply information throughout the NEPA process specified for the program and produce reports as requested to comply with the NEPA process, including the NEPA Environmental Questionnaire.

Subtask 3.2 – Contractual. A site access agreement will be negotiated to conduct field data collection activities on property near the Kemper County energy facility. Once in place, the site access contract will allow for negotiations with the surface preparation and drilling service providers (including site construction, drilling, cementing, and geophysical logging, etc.) to formulate an initial timeline of field activities. All service providers will meet site access contractual stipulations for performing services on Mississippi Power Company's properties.

Subtask 3.3 – Permitting and Site Survey. Information necessary for the to submit Mississippi Oil and Gas Board drilling and completion permits for the three characterization and monitoring wells will be prepared. The initial site survey work will be procured, and all wells will be drilled.

Task 4.0: Site Characterization and Modeling (Budget Periods 1 and 2) The Recipient in collaboration with its project team will develop a Site Characterization, Modeling, and Monitoring Plan to be delivered to DOE that will include the subtasks listed below. These primary reservoir characterization activities, utilizing both existing as well as new subsurface data and well bores, will be on-going throughout Phase II.

Subtask 4.1 – Assessment of Existing Subsurface Data. Available subsurface data that is located in the project area will be acquired for a preliminary analysis of the suitability of the site for safe, long-term storage of CO_2. Characteristics that will be confirmed include the target reservoirs' porosity and injectivity, geologic deposition (continuity) of the target formations, regional seals, and the presence of subsurface structures such as faults that may be conduits for out of zone CO_2 migration. A survey of existing wellbores will also be conducted.

Subtask 4.2 – Surface Seismic Surveys. Existing, commercially available 2D seismic data lines will be acquired, re-processed and reviewed to ascertain their applicability for test site characterization. Due to the large amount of available seismic data in the area, it is anticipated that existing data would be sufficient to characterize this sub-basinal region of the test and that acquisition of new seismic would be unnecessary in this Phase. The seismic surveys will be used to assess the subsurface structure, including the presence of major leakage pathways, depth and heterogeneity of the key formations including the injection targets and overlying seals, and to assist in the design of the drilling program. This information will be augmented with new and existing borehole geophysical logs to be taken from new wells.

Subtask 4.3 – Surface Characterization. The potential well sites will be surveyed to determine their suitability for: 1) drilling characterization/monitoring wells and, later, injection wells; 2) potential delivery points for CO_2 and well services; 3) locations for surface and subsurface monitoring equipment; and, 4) useable rights of way. To achieve these goals, site visits and surface surveys will be conducted to determine the existing infrastructure at the sites. A detailed map of the terrain and surface ownership will be developed to catalog existing subsurface penetrations and establish the level of effort necessary to prepare the site for well drilling and later injection of CO_2.

Subtask 4.4 – Reservoir Modeling. An initial geologic model of the target formations and seals will be constructed. A CO_2 injection simulation will also be conducted to estimate the behavior and areal extent of the CO_2 plume and the pressure increase during and after CO_2 injection. The reservoir model will draw on existing subsurface data from well logs taken in proximity to the injection site, from the new (and previous) regional geophysical surveys, and from the results of the previous injection tests that will have been conducted in the saline reservoir. The model will be re-calibrated once the well logs and core data are gathered and fully analyzed.

Subtask 4.5 – Risk Assessment. The Recipient in collaboration with its project team will design, conduct, and report on the results of an internal workshop-focused process to identify and evaluate risks associated with the Phase II project and future CO_2 injection at the Storage Complex. Within this process, the Recipient in collaboration with its project team will provide specific information about the project, share this information among those involved with the risk process, and provide semi-quantitative risk-evaluation data (e.g., likelihood and severity values) for analysis. Recommendations regarding risk assessment and/or risk management will be provided to DOE.

Subtask 4.6 – Risk Assessment Tools. The Project Team will integrate the numerical modeling results for the Storage Complex with DOE-sponsored risk assessment models obtained from the Integrated Assessment Model (https://edx.netl.doe.gov/nrap/), CO2 SCREEN Tool and other DOE Carbon Storage Program tools (https://edx.netl.doe.gov/tools), as applicable.

Subtask 4.7 – Data Sharing. Geologic data, analyses, and samples collected from the project will be provided to the National Carbon Sequestration Database and Geographic Information System (NATCARB) and the DOE core library, as appropriate and as outlined in the current Data Management Plan (reference Subtask 1.3).

Task 5.0 – Site Selection and Well Drilling (Budget Periods 1 and 2). The Recipient in collaboration with its project team will conduct the design and implementation of site selection, well drilling and completion, and monitoring for the project in coordination with MPC.

Subtask 5.1 – Well Site Selection. The Recipient in collaboration with its project team will travel to the Kemper County energy facility and the proposed Storage Complex to review potential drilling locations. These locations will be assessed and ranked based on considerations such as ease of access/egress, topography, location to existing structures, available roads, and avoidance of environmentally sensitive areas. Once the well sites are selected, bids will be obtained to conduct surface work at the site.

Subtask 5.2 – Well Design. The characterization wells, well sites, rig layouts, and any monitoring infrastructure needed for the project will be designed. The sites will be cleared, leveled, and compacted in preparation for the arrival of the drilling rig and ancillary equipment. Drilling rig and infrastructure layouts will be reviewed so that a lined pit can be placed in the proper location. Stone will be placed across the site to mitigate erosion and runoff. Wells will be designed to protect underground sources of drinking water (USDW) and will be compliant with UIC Class VI monitoring well requirements.

Subtask 5.3 - Well Drilling and Geologic Data Collection. The drilling and completion of the geologic characterization wells will be designed and supervised so that they may later function as a monitoring wells for commercial CO_2 injection operations at the Storage Complex. The wells will be drilled and cored and geologic data will be collected. The wells will penetrate and take whole core from a series of potential geologic storage intervals, potentially including the Lower Tuscaloosa Massive Sand, Washita–Fredericksburg and Paluxy formations, and their confining zone(s). This coring effort will be augmented with a full suite of geophysical logging tools, including "triple combo," wave form sonic, magnetic resonance imaging, electrochemical spectroscopy, and possibly formation micro-imaging logs. After geologic data acquisition, the well will be cased and cemented from total depth to ground surface. After these operations, the well will be temporarily abandoned in a manner such that it could be utilized later for UIC monitoring purposes. In addition, the site will be secured by a fencing system with locked and gated access. The Recipient in collaboration with its project team will coordinate site support and supervision from the well drilling setup phase through the temporary well abandonment phase..

Task 6.0 – Geologic Data Analysis (Budget Periods 1 and 2). A comprehensive study of the CO_2 injection and confining zones will be completed by integrating the geophysical log response and petrophysical properties observed in collected core samples. Further studies on scanning electron microscopy and micro-CT imaging will also be conducted. Caprock samples will be evaluated for CO_2 confining abilities including capillary entry pressure. The results of these analyses will be used to construct a geologic model for subsequent reservoir flow modeling. Regional geologic data, including prior scoping studies, existing well logs, and seismic lines, will be used to develop a preliminary regional geologic framework for CO_2 storage feasibility and capacity studies.

Subtask 6.1 – Core Analysis. Quantitative knowledge of caprock and reservoir rock properties and behaviors will increase the reliability with which caprock integrity and reservoir injectivity can be predicted. Confining unit core samples will be selected and provided for investigation of the confining capabilities of various low permeability layers at the Storage Complex. Minimum capillary displacement pressure experiments (breakthrough pressure), for caprock samples initially saturated with brine, will be conducted. Reservoir core plugs will undergo basic core analysis including grain density, porosity, air permeability, oil saturation, water saturation, and sample fluorescence. In addition, select core samples will be run in a CO_2-steady state CT core flood lab where CO_2-brine relative permeability curves will be generated. Additional analysis of the core samples, including core description, reservoir petrography, thin section description, including microscopy, SEM analysis, and interpretation of depositional environment and stratigraphic analysis, will be performed.

Subtask 6.2 – Refined Geologic Model. The collected geophysical logs will be processed and the log data will be calibrated to core results where appropriate. These analyses will be integrated with pre-existing well log information from legacy oil and gas exploratory wells to update the initial geologic model (Task 4.2) including updated depositional models and stratigraphic analyses. Local and regional geologic structure maps of potential storage and confining zones will be constructed, paying particularly close attention to the architecture of the storage reservoirs and continuity and thickness of the confining systems. Together these studies will be utilized to refine the geologic framework for the Storage Complex. These geologic analyses will be presented in detail to garner comments and suggestions and to capitalize on the diverse experience of the group. While the formal presentations of these materials will be performed during an on-site Project Team meeting, ongoing updates will be provided during routine phone calls to keep everyone updated.

Subtask 6.3 – Reactive Transport Simulations. The mineralogic data will be leveraged and geologic framework developed in Task 6.1 to conduct geochemical reactive fate and transport simulations of CO_2 injection. This work will evaluate the extent of geochemical reactions in the reservoir and their effects on changes in formation porosity and permeability. Pore and continuum scale simulations will be developed focused on the potential for mineral dissolution and precipitation reactions and their potential changes to pore-throat diameters.

Subtask 6.4 – Thermo-Hydro-Mechanical (THM) Modeling. Numerical modeling of coupled fluid flow, heat transport, and mechanical deformation will be conducted. The model can be used along with the other data collected from the site, such as microseismic monitoring data (if available), geological data, and core data, to assess geomechanical impacts of CO_2 injection, including surface deformation, induced seismicity, and leakage potential.

Task 7.0 – Infrastructure Development (Budget Periods 1 and 2). For developing the CO_2 storage facility, a preliminary understanding of how subsurface geology and its impact on well and injection design will impact well placement is essential for ensuring the optimal well placement. Similarly, the placement of these injection wells should also take into consideration the surface disposition (e.g., roads and water), topography, and disposition for linking the sources of CO_2 to the injection wells. A high-level review of the options at the Storage Complex will be performed and the *SimCCS* model will be deployed to review regional storage options for industrial sources of CO_2.

Subtask 7.1 – Site Infrastructure Development. An initial feasibility assessment and an implementation plan for the surface infrastructure to move high pressure CO_2 from the Kemper County energy facility to a series of CO_2 injection locations will be provided. This is expected to include a process design and cost estimate for the commercial facility, leveraged against the generated geologic and numerical simulation output.

Subtask 7.2 – Regional Infrastructure Assessment. An integrated CCS network will be developed, taking into account future CO_2 flows, uncertainty, and variable storage options. This will also include an analysis using the Kemper County energy facility as a regional CO_2 Storage Complex to receive CO_2 from CO_2-emitting industries. Results from this Task will help decision and policy-makers understand the role of large power utilities (such as Southern Company) in supporting regional, commercial-scale CO_2 management.

Task 8.0 – Commercial Development Plan (Budget Period 2). Utilizing the geologic model built from both site specific and regional geologic data, a preliminary reservoir flow model will be developed to assess and understand CO_2 plume movement in the subsurface. This model will be used to evaluate different injection scenarios, including stacked storage and pressure control, to optimize the storage efficiency and security at the Storage Complex. A suite of cases will be developed that reflect likely Storage Complex operating strategies. This information will be compiled to generate a first Draft Commercial Development Plan that will be readily updatable, thereby continuing to accelerate the timeline for commercial deployment of the Storage Complex.

Subtask 8.1 – Numerical Modeling of CO_2 Flow and Storage. The regional geologic framework developed in Task 6.2 will be incorporated to conduct large scale simulations to better understand how a CO_2 plume might develop and move within the subsurface at the Storage Complex as well as the pressure buildup associated with injection. Numerous injection well designs will be modeled to optimize the use of multiple, vertically stacked storage units. Key development output parameters (and their impact) to be ascertained will include CO_2 injectivity (number of injection wells required), plume movement (property rights), and brine movement (USDW protection). These numerical models will be used to generate possible areas of review (AoR). For each AoR, the CO_2 injection and monitoring wells will be identified and catalogued per UIC guidelines.

Subtask 8.2 – Commercial Development Plan. All information, reports, and deliverables collected in support of the project will be compiled into a Final Report, which will serve as an updateable framework for a UIC Class VI permit. This Commercial Development Plan will be assembled in such a way that geologic and reservoir information collected during future phases of the project can be readily incorporated. Components of the plan are expected to include Administrative Information, Geology, Numerical Modeling, Area of Review, Well Construction, CO_2 Description, and a Monitoring Program.

DELIVERABLES

The periodic and final reports shall be submitted in accordance with the Federal Assistance Reporting Checklist attached to the negotiated Financial Assistance Award and the instructions accompanying the checklist. In addition to the reports specified in the "Federal Assistance Reporting Checklist", the Recipient will provide the following to the DOE Project Officer (identified in Block 15 of the Assistance Agreement as the Program Manager):

- **Project Management Plan (PMP).** The Recipient shall modify (if needed) the PMP provided under Section 2 of the Project Narrative and re-submit the PMP to DOE 30 days after award. PMP should be updated as necessary throughout the project as requested by the Project Officer.

- **Data Submitted to NETL-EDX.** Data generated as a result of this project shall be submitted to NETL for inclusion in the NETL Energy Data eXchange (EDX), https://edx.netl.doe.gov/. The Recipient will work with the DOE Project Officer to assess if there is data that should be submitted to EDX and identify the proper file formats prior to submission. All final data generated by this project will be submitted to EDX including, but not limited to: 1) datasets and files, 2) metadata, 3) software/tools, and 4) articles developed as part of this project.

Task / Subtask Number	Deliverable Number	Deliverable Title
1.0	1.3.b	Catalog of Geologic Material submitted at the end of each project year and at the end date of the project.
2.3	2.3	Report on Knowledge Sharing and Outreach at completion of Budget Period 2.
3.1	3.1	Completed NEPA Questionnaire at the time of well location identification.
3.2	3.2	Site Access Agreement 1 week after receipt.
3.3	3.3	Well Drilling Permits 1 week after receipt.
4.1	4.1	Report on Subsurface Characterization Wells 90 days prior to Budget Period 2.
4.2	4.2	Interpreted Seismic Survey Report 60 days after completion of Subtask 4.2.
4.5	4.5	Kemper Storage Complex Commercial Risk Assessment at completion of Budget Period 2.
4.6	4.6	Risk Assessment Tool Report at completion of Budget Period 2.
5.1	5.1	Drilling Site Selection and Survey Report 60 days after completion of Subtask 5.1.
5.2	5.2	Well Design Report 60 days after completion of Subtask 5.2.
5.3	5.3.a	Well and Security Installation Report 60 days after completion of Subtask 5.3.
5.3	5.3.b	Geologic Characterization Well Report 60 days after completion of Subtask 5.3.

6.1	6.1	Core Analysis Report at completion of Budget Period 2.
6.2	6.2.a	Final Geophysical Well Log Report at completion of Budget Period 2.
6.2	6.2.b	Geologic Framework for the Kemper Storage Complex Report at completion of Budget Period 2.
6.3	6.3	Reactive Transport Analysis Report at completion of Budget Period 2.
6.4	6.4	Thermo-Hydro-Mechanical Modeling Report at completion of Budget Period 2.
7.1	7.1	Site Infrastructure Development and Estimated Costs at completion of Budget Period 2.
7.2	7.2	Regional Infrastructure Assessment at completion of Budget Period 2.
8.1	8.1.a	Numerical Modeling Report at completion of Budget Period 2.
8.1	8.1.b	Identification of Wells Within the AoR at completion of Budget Period 2.
8.2	8.2	Commercial Development Plan 30 days after completion of Budget Period 2.

BRIEFINGS/TECHNICAL PRESENTATIONS

The Recipient shall prepare detailed briefings for presentation to the Project Officer at the Project Officer's facility located in Pittsburgh, PA or Morgantown, WV. The Recipient shall make a presentation to the NETL Project Officer/Manager at a project kick-off meeting held within ninety (90) days of the project start date. At a minimum, annual briefings shall also be given by the Recipient to explain the plans, progress, and results of the technical effort and a final project briefing at the close of the project shall also be given.