

**Exhibit A
SCOPE OF WORK**

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2	X	Preliminary Assessment of CO ₂ Storage Potential in the Tertiary Basins and Deep Paleozoic Formations of Arizona
3		Revise CO ₂ Storage Potential Estimates for Assessed Regions Based on Salinity

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Jeri Young, Steve Rauzi, Phil Pearthree, Brian Gootee	N/A	N/A
2	Brian Gootee, Steve Rauzi	N/A	N/A
3	Mike Mahan, Steve Rauzi	N/A	N/A

GLOSSARY

Specific terms and acronyms used throughout this work statement are defined as follows:

Acronym	Definition
AGRC	Automated Geographic Reference Center
ADEQ	Arizona Department of Environmental Quality
AZDWR	Arizona Department of Water Resources
AZGS	Arizona Geological Survey
CCS	Carbon Capture and Storage
CO ₂	Carbon Dioxide
CPR	Critical Project Review
DOE	U. S. Department of Energy
Energy Commission	California Energy Commission
GHG	Green House Gas
GIS	Geographical Information System
mg/l	Milligrams per liter
NatCarb	National Carbon Atlas
PIER	Public Interest Energy Research

Acronym	Definition
RD&D	Research Development & Demonstration
TDS	Total Dissolved Solids
UCC.1	Uniform Commercial Code (Financing Statement)
WESTCARB	West Coast Regional Carbon Sequestration Partnership

Problem Statement

Carbon capture and storage (CCS) technologies could play a critical role in mitigating the impact of fossil fuel-based electricity generation on greenhouse gas (GHG) build up and resulting climate change. The Public Interest Energy Research (PIER) program continues to conduct research to define least-cost GHG mitigation strategies including an assessment of the potential for CCS. In parallel, the U.S. Department of Energy (DOE) is actively engaged in geologic CCS projects through a network of regional partnerships, including the West Coast Regional Carbon Sequestration Partnership (WESTCARB) currently administered by PIER.

Along with large-scale testing, WESTCARB Phase III work includes expanding previous studies identifying and validating potential geologic carbon storage areas in all of the WESTCARB states and provinces (California, Arizona, Hawaii, Nevada, Oregon, Washington, Alaska, and the Canadian province of British Columbia). This agreement would provide for an expanded assessment and geological characterization of potential subsurface carbon dioxide (CO₂) storage areas in the state of Arizona.

The Arizona Geological Survey (AZGS), working in conjunction with Southwest Regional Carbon Sequestration Partnership, previously evaluated the CO₂ storage potential in Arizona. They examined un-mineable coal seams, oil and gas fields, and select basins. AZGS determined that the total geologic storage capacity in these areas is potentially on the order of 27,521 million metric tons. Nearly 88% of that capacity was estimated to be located in deep Paleozoic formations underlying the Navajo power plant, near the city of Page in northern Arizona. The remaining 12% of storage capacity is located in deep Paleozoic formations underlying power plants in the Holbrook basin in northern Arizona, in deep Tertiary basins underlying power plants in southern Arizona, and within existing oil and gas fields. Characterization of potential deep formations in northern Arizona was limited to a radius of about 50 miles from existing power plants. In addition, the study area was limited to select basins chosen without applying a consistent methodology. Hence, the resulting estimated capacity did not represent a comprehensive assessment for the geologic storage potential across the state. Additional assessment and characterization of the CO₂ storage potential in deep basins and saline formations throughout the state of Arizona will extend and complement the earlier AZGS evaluation which provided estimates of geologic storage potential throughout the state of Arizona.

Goals of the Agreement

The goal of this Agreement is to provide a comprehensive evaluation of the potential of subsurface CO₂ storage for the state of Arizona as part of the WESTCARB Phase III regional geologic characterization and CO₂ storage assessment activities.

Objectives of the Agreement

The objectives of this Agreement are to:

- 1) Identify and assess subsurface geologic formations in the Colorado Plateau and Basin and Range Provinces of Arizona for CO₂ storage potential
- 2) Determine where subsurface salinities approach 10,000 milligrams per liter (mg/l) of total dissolved solids (TDS) for areas identified as having potential for CO₂ storage
- 3) Revise preliminary storage estimates in accordance with salinity data generated
- 4) Compile data and findings in geographical information system (GIS) format to transmit to the Utah Automated Geographic Reference Center (AGRC) for inclusion in the National Carbon Atlas (NatCarb).

TASK 1.0 ADMINISTRATION

MEETINGS

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Contractor shall:

- Attend a “kick-off” meeting with the Commission Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Commission Contract Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Contract Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Terms and conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Contract Manager's expectations for accomplishing tasks described in the Scope of Work;
- An updated Schedule of Deliverables
- Progress Reports (Task 1.4)
- Technical Deliverables (Task 1.5)
- Final Report (Task 1.6)

The Commission Contract Manager shall designate the date and location of this meeting.

Contractor Deliverables:

- An Updated Schedule of Deliverables
- An Updated List of Match Funds
- An Updated List of Permits

Commission Contract Manager Deliverables:

- Final Report Instructions

Task 1.2 CPR Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Contract Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Commission Contract Manager may schedule additional CPRs as necessary, and any additional costs will be borne by the Contractor.

Participants include the Commission Contract Manager and the Contractor, and may include the Commission Contracts Officer, the PIER Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Commission Contract Manager to provide support to the Energy Commission.

The Commission Contract Manager shall:

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.

- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the Commission Contract Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Energy Commission's Research, Development and Demonstration Policy Committee for its concurrence.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

The Contractor shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the Commission Contract Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Contractor Deliverables:

- CPR Report(s)
- CPR deliverables identified in the Scope of Work

Commission Contract Manager Deliverables:

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Contractor shall:

- Meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Contractor, the Commission Contracts Officer, and the Commission Contract Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting,

which may be two separate meetings at the discretion of the Commission Contract Manager.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Commission Contract Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Contract Manager and the Contracts Officer about the following Agreement closeout items:

- Need to file UCC.1 form re: Energy Commission's interest in patented technology
 - Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
 - Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
 - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
 - Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Deliverables:

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

REPORTING

See Exhibit D, Reports/Deliverables/Records.

Task 1.4 Quarterly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

The Contractor shall:

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

Deliverable:

- Quarterly Progress Reports

Task 1.5 Test Plans, Technical Reports and Interim Deliverables

The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/>

The Contractor shall:

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

Task 1.6 Final Report

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The Commission Contract Manager will review and approve the Final Report. The Final Report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/>

The Final Report shall be a public document. If the Contractor has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Contractor shall perform the following subtasks for both the public and confidential versions of the Final Report.

Task 1.6.1 Final Report Outline

The Contractor shall:

- Prepare a draft outline of the Final Report.
- Submit the draft outline of Final Report to the Commission Contract Manager for review and approval. The Commission Contract Manager will provide written

comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

Deliverables:

- Draft Outline of the Final Report
- Final Outline of the Final Report

Task 1.6.2 Final Report

The Contractor shall:

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the Commission Contract Manager for review and comment. The Commission Contract Manager will provide written comments within 10 working days of receipt.

Once agreement on the draft Final Report has been reached, the Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Commission Contract Manager shall provide written approval to the Contractor within 5 working days.

- Submit one bound copy of the Final Report with the final invoice.

Deliverables:

- Draft Final Report
- Final Report

MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT

Task 1.7 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. While the PIER budget for this task will be zero dollars, the Contractor may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Contractor can incur any costs for which the Contractor will request reimbursement.

The Contractor shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:
 1. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter.
 2. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
 - A list of the match funds that identifies the:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Contractor shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
 - A copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are significantly reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Contract Manager within 10 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

Deliverables:

- A letter regarding Match Funds or stating that no Match Funds are provided
- Letter(s) for New Match Funds
- A copy of each Match Fund commitment letter
- Letter that Match Funds were Reduced (if applicable)

Task 1.8 Identify and Obtain Required Permits or Other Authorizations

The goal of this task is to identify, in advance, and obtain any and all permits, or other authorizations, that may be necessary for work completed under this Agreement. [Note: While no permits or authorizations are currently anticipated for the technical activities associated with this agreement, this task is included to prevent project delays due to unforeseen permits or other authorizations that may be associated with project activities.]

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. While the PIER budget for this task will be zero dollars, the Contractor shall show match funds for this task. Permits must be identified in writing and obtained before the Contractor can incur any costs related to the use of the permits for which the Contractor will request reimbursement.

The Contractor shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:
 1. If there are no permits required at the start of this Agreement, then state such in the letter.
 2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions or lead agencies
 - Schedule the Contractor will follow in applying for and obtaining these permits.
- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permits will be developed. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the appropriate information on each permit and an updated schedule to the Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Contract Manager.

- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Contract Manager within 5 working days. Either of these events may trigger an additional CPR.

Deliverables:

- A letter documenting the Permits or stating that no Permits are required
- Updated list of Permits as they change during the Term of the Agreement
- Updated schedule for acquiring Permits as it changes during the Term of the Agreement
- A copy of each approved Permit

Task 1.9 Electronic File Format

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

The Contractor shall:

- Deliver documents to the Commission Contract Manager in the following formats:
 - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
 - PC-based text documents shall be in MS Word file format.
 - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
 - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

Deliverable:

- A letter requesting exemption from the Electronic File Format (if applicable)

TECHNICAL TASKS

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.5. Deliverables not requiring a draft version are indicated by marking “(no draft)” after the deliverable name.

Task 2: Assessment of CO₂ Storage Potential in the Tertiary Basins and Deep Paleozoic Formations of Arizona

The goal of this task is to identify and assess the CO₂ storage potential in Arizona through:

1. Identification and delineation of the subsurface formation regions and groups to be considered for CO₂ storage evaluation within the Tertiary sedimentary basins in the Basin and Range Province and the deep Paleozoic formations of the Colorado Plateau province in Arizona.
2. Broad-scale screening of depth of Tertiary basins by refining depth-to-bedrock maps for basins with potential storage capacity and providing simplified structural and stratigraphic information based on available reports, borehole data, and geologic maps.
3. Characterization improvements of deep Paleozoic saline formations of the Colorado Plateau using geologic cross-sections, stratigraphic relationships, geologic mapping, and borehole datasets.

The Contractor shall:

- Interpret sedimentary basin outlines for Arizona's Tertiary basins and deep Paleozoic formations of the Colorado Plateau, and submit screened, attributed GIS data layers of sedimentary basin outlines.
- For those basins and formations where sufficient geologic unit-specific data are available, analyze this information and attribute the GIS layers with these data. Compile and characterize geologic data that shall include but not be limited to the following information:
 - Location
 - Lithology
 - Nature of seals
 - Depth and structure
 - Average thickness and spatial extent
 - Rock properties, including porosity and permeability
 - Physical and chemical properties of brine
 - Faults and fractures
 - Reservoir temperature
- Where possible, collect data similar to that of target formations on the presence of seals (cap rocks) in the aforementioned regions of Arizona.
- Where possible, analyze and estimate the geologic CO₂ storage capacity in the aforementioned regions of Arizona in accordance with DOE's 2008 Methodology for Development of Geologic Storage Estimates for Carbon Dioxide, located at: http://www.netl.doe.gov/technologies/carbon_seq/refshelf/methodology2008.pdf .
- Prepare and submit unscreened GIS layers in accordance with AGRC guidelines of basin outlines having storage potential to the WESTCARB GIS data clearinghouse maintained by the Utah AGRC.
- Present the results of this Task in a CPR meeting as specified in Task 1.2 and also include these results in the Final Report specified in Task 1.6.

Deliverables:

- Screened Attributed GIS Data Layers of Sedimentary Basin Outlines (no draft)

- Data for Geologic CO₂ Storage Capacity Estimates for Basins and Paleozoic formations (no draft)
- Unscreened GIS Layers of Basin Outlines (no draft)
- CPR Report

Task 3: Revise CO₂ Storage Potential Estimates for Assessed Regions Based on Salinity

The goal of this task is to determine if, and at what depth, salinities approach 10,000 mg/l TDS, in the Tertiary basins and deep Paleozoic formations with potential CO₂ storage capacity. This concentration is the upper limit for an “underground source of drinking water” as defined by 40 Code of Federal Regulation Chapter.1 part 144.3.

The Contractor shall:

- For the basins and formations previously identified in Task 2, evaluate the formation water salinities, where data are available, within formations underlying those areas meeting the 10,000 mg/l TDS minimum criteria proposed for CO₂.
- Estimate salinities from available datasets from sources such as AZDWR, ADEQ, and AZGS, including oil and gas records. Starting with the deeper wells within each respective formation, calculate salinities for the uppermost and lowermost brine-saturated sandstones within each respective formation. Selected well logs can be used to fill out areas in the shallower formations where no deep control exists.
- Plot and contour salinity data to produce generalized salinity maps (iso-salinity) for the top of each formation. Plot salinity data for the deepest penetrated saline sandstone. If the uppermost sandstone has a salinity below 10,000 mg/l TDS and the deepest sandstone exceeds 10,000 mg/l TDS, then calculate the salinities of progressively shallower sandstones to determine the approximate depth to salinities exceeding 10,000 mg/l TDS.
- Revise the estimates for Carbon Storage Potential prepared in Task 2 as necessary to incorporate salinity data in determining formations with CO₂ potential.
- Prepare and submit attributed GIS data layers to the Utah AGRC in accordance with AGRC guidelines showing the salinity at the top of each formation for areas studied and the depth to 10,000 mg/l TDS.
- Include the results of this Task in the Final Report specified in Task 1.6.

Deliverables:

- Data for Revised Estimates for Carbon Storage Potential Incorporating Salinity Data (no draft)
- Attributed GIS Data Layers (no draft)