

GRANTS/CONTINGENT AWARD REQUEST



To: Grants and Loans Office

Date: 2/24/2010

Project Manager: Johann Karkheck

Phone Number: 916-327-2457

Office: Energy Systems Research Office

Division: Energy Research and Development

MS- 43

Project Title: Advanced Underground CAES Demonstration Project Using a Saline Porous Rock Formation as the

Type of Request: (check one)

[X] New Agreement: (include items A-F from below) Agreement Number: PIR-11-004
Program: PIER E / Energy Technology Systems Integration
Solicitation Name and/or Number: PON08011.11-07 (ARRA Cost Share: Smart Grid Demonstrations)
Legal Name of Recipient: Pacific Gas and Electric Company
Recipient's Full Mailing Address: 245 Market St Rm 938
San Francisco, CA 94105-1702
Recipient's Project Officer: Michael Medeiros Phone Number: 415-973-6270
Agreement Start Date: 11/26/2012 Agreement End Date: 3/15/2015

[] Amendment: (Check all that apply) Agreement Number: _____
[] Term Extension - New End Date: _____
[] Work Statement Revision (include Item A from below)
[] Budget Revision (include Item B from below)
[] Change of Scope (include Items A - F as applicable from below)
[] Other: _____

ITEMS TO ATTACH WITH REQUEST:

- A. Work Statement
B. Budget
C. Recipient Resolution, if applicable. (Resolution may be requested in Special Conditions if not currently available.)
D. Special Conditions, if applicable.
E. CEQA Compliance Form
F. Other Documents as applicable
• Copy of Score Sheets
• Copy of Pre-Award Correspondence
• Copy of All Other Relevant Documents

California Environmental Quality Act (CEQA)

[] CEC finds, based on recipient's documentation in compliance with CEQA:
[] Project exempt: _____ NOE filed: _____
[] Environmental Document prepared: _____ NOD filed: _____
[] Other: _____
[X] CEC has made CEQA finding described in CEC-280, attached

Funding Information:

*Source #1: PIER-E Amount: \$ 1,000,000.00 Statute: 11- FY: 12-13 Budget List #: 501.027J
*Source #2: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____
*Source #3: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____

If federally funded, specify federal agreement number: _____

* Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.

Business Meeting Approval: (refer to Business Meeting Schedule)

Proposed Business Meeting Date: 10/10/2012 [] Consent [X] Discussion
Business Meeting Participant: Johann Karkheck Time Needed: 5 minutes

Agenda Notice Statement: (state purpose in layperson terms)

Possible approval of a [X] Grant / [] Contingent Award to...

Possible approval of Agreement PIR-11-004 for a grant of \$1,000,000 to Pacific Gas & Electric Company to verify the performance of an advanced, underground compressed air energy storage plant for providing ancillary services to the electric grid. This award will be cost-share for the Recipient's \$25 million American Recovery and Reinvestment Act of 2009 award. (PIER electricity funding). Contact: Johann Karkheck (5

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TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2	X	Phase 1 - Geologic Site Selection, Verification, and Engineering

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1		Booth and Associates International	
2		Booth and Associates International Worley Parsons Group Inc.	

GLOSSARY

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

Term/ Acronym	Definition
CAES	Compressed Air Energy Storage
California ISO	California Independent System Operator
CPR	Critical Project Review
DOE	United States Department of Energy
Energy Commission	California Energy Commission
MW	Megawatt
NERC	North American Electric Reliability Corporation
PG&E	Pacific Gas and Electric Company
PIER	Public Interest Energy Research
SOPO	Statement of Project Objectives for DOE Award No. DE-OE0000198
VAR	Volt-Amperes Reactive

Problem Statement:

The state will need additional ancillary services to meet the goal of adding 20% (33% is under consideration) of renewable, intermittent resources. This need has been recognized and discussed at the national level by the North American Electric Reliability Corporation (NERC) in its April 2009 report, *Accommodating High Levels of Variable Generation* and by the California Independent System Operator (California ISO) in its November 2007 report, *Integration of Renewable Resources - Transmission and Operating Issues and Recommendations for Integrating Renewable Resources on the California ISO-Controlled Grid*. The California ISO report found that with 4,000 megawatts (MWs) of new wind, California would need substantially more ancillary services.

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Goals of the Agreement:

The goal of this Agreement is to demonstrate the viability of advanced, compressed air energy storage (CAES) technology utilizing a porous rock formation. This project will establish the costs and benefits of CAES, verify its technical performance, and validate system reliability and durability at a scale that can be readily adapted and replicated around the country.

Objectives of the Agreement:

The objectives of this Agreement are to demonstrate the viability of advanced, underground CAES technology and develop best practices to accelerate the technology's market readiness in the United States. This agreement will establish the costs and benefits of CAES, verify its technical performance, and validate system reliability and durability at a scale that can be readily adapted and replicated around the country. The key objectives of the overall agreement are to:

- 1) Verify the technical performance of advanced CAES technology using a porous rock formation as the underground storage reservoir;
- 2) Integrate intermittent renewable resources by using the CAES plant to provide ramping/regulation to steady the power fluctuations from load and intermittent renewable generation;
- 3) Use the CAES plant to provide emergency spinning/non-spinning reserve (synchronous and non-synchronous); and
- 4) Perform Volt-Amperes Reactive (VAR)/voltage support.

This Agreement is expected to produce measurable benefits such as reduced greenhouse gas emissions, improved grid reliability and flexibility, and lower electric power system costs.

TASK 1 ADMINISTRATION

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 Recipient shall:

- Attend a "Kick-Off" meeting with the California Energy Commission (Energy Commission) Project Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Energy Commission Project 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 Energy Commission Project Manager will provide an agenda to all potential meeting participants.

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

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (CPR) (Task 1.2)
- Match fund documentation (Task 1.6)
- Permit documentation (Task 1.7)

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

- The Energy Commission Project Manager's expectations for accomplishing tasks described in the Scope of Work
- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)
- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of Project Fact Sheet
- Discussion of the Final Report (Task 1.5)

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

Recipient Products:

- Updated Schedule of Products (no draft)
- Updated List of Match Funds (no draft)
- Updated List of Permits (no draft)
- Draft Project Fact Sheet

Energy Commission Project Manager Product:

- Kick-Off Meeting Agenda (no draft)

Task 1.2 Critical Project Review Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule, or budget.

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

Participants include the Energy Commission Project Manager and the Recipient and may include the Energy Commission Grants Officer, the Public Interest Energy

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Research (PIER) Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Energy Commission Project Manager to provide support to the Energy Commission.

If the United States Department of Energy (DOE) is conducting similar meetings, the Recipient shall notify and invite the Energy Commission Project Manager to participate, either by teleconference or by actual meeting attendance. The DOE-required meetings may be used in place of the Energy Commission's CPR meetings, at the discretion of the Energy Commission Project Manager.

The Energy Commission Project Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient 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 modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see the Terms and Conditions).
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to the project status. This includes copies of project performance reviews on Recipient work and summaries and results of project review meetings with the DOE.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Energy Commission Project Manager Products:

- Agenda and a list of expected participants (no draft)
- Schedule for written determination (no draft)
- Written determination(no draft)

Recipient Products:

- DOE correspondence and reporting (no draft)

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Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement. If the DOE is conducting a similar final meeting, the Recipient shall notify and invite the Energy Commission Project Manager to participate, either by teleconference or by actual meeting attendance. The DOE required meeting may be used in place of the Energy Commission's final meeting, at the discretion of the Energy Commission Project Manager. However, all items listed in this task shall be covered in the meeting.

The Recipient shall:

- Meet with Energy Commission staff 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 Recipient, the Energy Commission Grants Office Officer, and the Energy Commission Project 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 Energy Commission Project Manager.

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Recipient shall submit an updated Project Fact Sheet incorporating the project results to date and expected project completion date. The Energy Commission Project Manager will determine the appropriate meeting participants.

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

- What to do with any equipment purchased with Energy Commission funds (Options)
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions, such as repayment provisions and confidential Products
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.
- Copies of all non-privileged, non-proprietary correspondence and reports discussing DOE's findings on the project, and future

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disposition of the project, if applicable. When directed by the Energy Commission Project Manager, recipient will provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to project performance.

Recipient Products:

- Updated Project Fact Sheet
- Written documentation of meeting agreements (no draft)
- Schedule for completing closeout activities (no draft)
- DOE correspondence on project findings and results (no draft)

Task 1.4 Monthly 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 on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

With Commission Project Manager approval, the Recipient can submit a DOE Progress Report in lieu of the required Commission report if it contains the information listed in Attachment 1 of the Terms and Conditions.

The Recipient shall:

- Prepare monthly Progress Reports which summarize all Agreement activities conducted by the Recipient 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 Energy Commission Project Manager within 10 days of the end of the reporting period.
- Unless otherwise directed by the Energy Commission Project Manager, each Progress Report must contain any reports made to DOE, including summaries of meetings with DOE, as it relates to the project outcome and performance. Include names and contacts of DOE representatives.

Recipient Products:

- Monthly Progress Reports (no draft)
- Copies of DOE reporting and meeting summaries (no draft)

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Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The final report shall describe the following at a minimum: a) original purpose, approach, activities performed, results and conclusions of the work done under this Agreement; b) how the project advanced science and technology to the benefit of California's ratepayers and the barriers overcome; c) assessment of the success of the project as measured by the degree to which goals and objectives were achieved; d) how the project supported California's economic recovery in the near term and number of jobs created or sustained; e) how the project results will be used by California industry, markets and others; f) projected cost reduction impact and other benefits resulting from the project; g) discuss the project budget, including the total project cost and all the funding partners and their cost share; h) discuss how the Energy Commission funding was spent on the project, including any unique products and benefits; i) observations, conclusions and recommendations for further research, development, and demonstration projects and improvements to the PIER project management process.

If a final report is required by the DOE, the Recipient will include a copy of it along with the Energy Commission's final report requirements. In addition, the Recipient shall submit the draft final DOE report to the Energy Commission for review at the same time the Recipient submits it to the DOE.

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

The Recipient shall:

- Provide a draft copy of the Final Report including a copy of the draft submitted to the DOE in response to the American Recovery and Reinvestment Act Funding Opportunity Notice for which an award was received. The Final Report shall be completed on or before the end of the Agreement Term.
- Submit written non-privileged, non-proprietary correspondence from the DOE regarding acceptance of the final report.

Recipient Products:

- Draft Final Report, including a copy of the draft report submitted to the DOE
- Final Report, including a copy of the final report submitted to the DOE
- Written non-privileged, non-proprietary correspondence from the DOE regarding acceptance of final report (no draft)

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Task 1.6 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. Although the PIER budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Energy Commission Project Manager at least 2 working days prior to the Kick Off meeting. The letter needs to identify the following at a minimum:
 - 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 Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide 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 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 Energy Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Energy Commission Project Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Recipient Products:

- A letter regarding match funds (no draft)

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- Copy(ies) of each match fund commitment letter(s) (no draft)
- Letter(s) for new match funds (if applicable) (no draft)
- Letter that match funds were reduced (if applicable) (no draft)

Task 1.7 Identify and Obtain Required Permits

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. Although the PIER budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditures for which a permit is required.

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Energy Commission Project Manager at least 2 working days prior to the Kick-Off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. 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
 - The schedule the Recipient will follow in applying for and obtaining these permits.
- Discuss the list of permits and the schedule for obtaining them at the Kick-Off meeting and develop a timetable for submitting the updated list, schedule, and the copies of the permits. 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, provide the appropriate information on each permit and an updated schedule to the Energy Commission Project Manager.
- As permits are obtained, send a copy of each approved permit to the Energy Commission Project Manager.

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- If during the course of the Agreement permits are not obtained on time or are denied, notify the Energy Commission Project Manager within 10 days. Either of these events may trigger an additional CPR.

Recipient Products:

- Letter documenting the permits or stating that no permits are required (no draft)
- A copy of each approved permit (if applicable) (no draft)
- Updated list of permits as they change during the term of the Agreement (if applicable) (no draft)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable) (no draft)

Task 1.8 Project Management

The goal of this subtask is to provide all other required project management activities not specified under Tasks 1.1 through 1.7 required by the DOE for this project.

The Recipient shall:

- Provide the overall project management functions for this project including initiation, planning, execution, tracking, DOE reporting activities, and program closeout. These activities include preparing project plans, security plans and assessments, detailed project schedules and budgets, and Earned Value Management metrics and reporting. The Monthly Progress Reports specified in Task 1.4 shall summarize these activities.
- Provide copies of the following DOE Products in accordance with the Statement of Project Objectives for DOE Award Number DE-OE0000198 (SOPO):
 - Project Management Plan and updates
 - Metrics and Benefits Reporting Plan
 - Technology Performance Reports

Recipient Products:

- Other project management activities reported in Monthly Progress Reports (no draft)
- Project Management Plan and updates (no draft)
- Metrics and Benefits Reporting Plan (no draft)
- Technology Performance Reports (no draft)

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TECHNICAL TASKS

Note: The Energy Commission is co-funding portions of Phase 1 of this three-phase project. This Work Statement describes only the work that the Energy Commission is co-funding.

Execution of Phase 2 (Plant Construction, Commissioning, and Operation) and Phase 3 (Plant Monitoring and Technology Transfer) of this project are contingent upon obtaining a viable demonstration site at the end of Phase 1 and DOE's approval to proceed with the subsequent phases. The Energy Commission requests that the Recipient submit copies of non-privileged, non-proprietary DOE Products for Phase 2 and Phase 3.

TASK 2 PHASE 1 – GEOLOGIC SITE SELECTION, VERIFICATION, AND ENGINEERING

Subtask 2.1 Project Engineering Support

The goal of this subtask is to perform engineering services to produce the DOE Products.

The Recipient shall:

- Provide project engineering services to prepare presentations and products to DOE described in Task 1.
- Attend project coordination meetings.
- Submit copies of all non-privileged, non-proprietary products submitted to the DOE.
- Submit copies of the DOE's written comments on all products.
- Submit written correspondence from the DOE regarding acceptance of each product.

Recipient Products:

- Copies of non-privileged, non-proprietary products submitted to the DOE (no draft)
- Copies of DOE's written comments on all products (no draft)
- Written correspondence from DOE regarding acceptance of each product (no draft)

Subtask 2.2 Preliminary Engineering & Design

The goal of this subtask is to develop a design for the CAES plant for the preferred site.

The Recipient shall:

- Prepare engineering documentation to support construction of the CAES plant.
- Submit copies of all non-privileged, non-proprietary products submitted to the DOE.

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- Submit copies of the DOE's written comments on all products.
- Submit written correspondence from the DOE regarding acceptance of each product.

Recipient Products:

- Copies of non-privileged, non-proprietary products submitted to the DOE (no draft)
- Copies of DOE's written comments on all products (no draft)
- Written correspondence from DOE regarding acceptance of each product (no draft)

Subtask 2.3 Cost, Schedule, and Economic Modeling

The goal of this subtask is to develop an optimized equipment design for the CAES plant.

The Recipient shall:

- Develop capital cost estimates; cash flow projections; operations and maintenance estimates; Engineering, Procurement, and Construction schedules; and a range of economic modeling data.
- Optimize the equipment and cycle design for each CAES technology based on the air reservoir characteristics, iterative feedback from the economic modeling team, and other boundary conditions as appropriate.
- Submit copies of all non-privileged, non-proprietary products submitted to the DOE.
- Submit copies of the DOE's written comments on all products.
- Submit written correspondence from the DOE regarding acceptance of each product.

Recipient Products:

- Copies of non-privileged, non-proprietary products submitted to the DOE (no draft)
- Copies of DOE's written comments on all products (no draft)
- Written correspondence from DOE regarding acceptance of each product (no draft)