



To: Grants and Loans Office

Date: 3/28/2012

Project Manager: Pablo Gutierrez

Phone Number: 916-327-1542

Office: Energy Generation Research Office

Division: Energy Research and Development

MS- 43

Project Title: Combined Heat and Power with Thermal Storage for Modern Greenhouses

Type of Request: (check one)

New Agreement: (include items A-F from below) Agreement Number: PIR-11-023

Program: PIER NG / Renewables

Solicitation Name and/or Number: PON-11-507-08 (Hybrid Generation and Fuel-flexible Distributed Generation/Combined Heat and Power/Combined Cooling, Heat and Power (DG/CHP/CCHP) Systems)

Legal Name of Recipient: Southern California Gas Company

Recipient's Full Mailing Address: 555 W 5TH ST
LOS ANGELES, CA 90013-1010

Recipient's Project Officer: Dale Fontanez Phone Number: _____

Agreement Start Date: 6/29/2012 Agreement End Date: 3/31/2015

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: _____

CEC has made CEQA finding described in CEC-280, attached

Funding Information:

*Source #1: NG Amount: \$ 1,502,699.00 Statute: 10- FY: 11-12 Budget List #: 501.001E

*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: 5/9/2012 Consent Discussion

Business Meeting Participant: Pablo Gutierrez Time Needed: 5 minutes

Agenda Notice Statement: (state purpose in layperson terms)

Possible approval of a Grant / Contingent Award to...

Possible approval of Agreement PIR-11-023 for a grant of \$1,502,699.00 with Southern California Gas Company to assess, design and demonstrate the economical operation of Combined Heat and Power in a state-of-the-art greenhouse. (PIER natural gas funding.) Contact: Pablo Gutierrez. (5 minutes)

Project Manager _____ Date _____ Office Manager _____ Date _____ Deputy Director _____ Date _____

Exhibit A WORK STATEMENT

TECHNICAL TASK LIST

Task #	Task Name
1	Administration
2	Functionality Requirements
3	Preliminary Design
4	Detailed Design
5	Procurement, Installation & Commissioning
6	Performance Monitoring
7	Market Transfer Activities

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	D. Fontanez, Southern California Gas Company (SCGC)	K. Davidson, DE Solutions (DES)	-
2	D. Fontanez, SCGC	K. Davidson, DES	R. Erwin, Windset Farms
3	D. Fontanez, SCGC	R. Wait, Control Technology L. Myrek, Brummel, Myrick, & Associates (BMA)	R. Erwin, Windset Farms
4	D. Fontanez, SCGC	R. Wait, Control Technology L. Myrek, BMA	R. Erwin, Windset Farms
5	D. Fontanez, SCGC	J. Williams, JW Design & Construction (JWDCI)	S. Hall, Western Energy Solutions (WES) R. Erwin, Windset Farms
6	D. Fontanez, SCGC	Y. Yu, Conservation Tech	-
7	D. Carrell, SCGC	K. Davidson, DES	S. Hall, WES R. Erwin, Windset Farms

GLOSSARY

Term/ Acronym	Definition
APCD	Santa Barbara County Air Pollution Control District
BMA	Brummel, Myrick & Associates
CARB	California Air Resource Board
CHP	Combined Heat and Power
CPR	Critical Project Review
DES	DE Solutions
Energy Commission	California Energy Commission
FIT	Feed-in-tariff
FTD	Fuels and Transportation Division
GHG	Greenhouse Gas

Exhibit A WORK STATEMENT

Term/ Acronym	Definition
HHV	Higher Heating Value
JWDCI	JW Design & Construction
NOx	Nitrogen Oxide
PG&E	Pacific Gas & Electric Company
PPA	Power Purchase Agreement
SCGC	Southern California Gas Company
WES	Western Energy Solutions

Problem Statement:

There are a number of challenges to cost effectively applying Combined Heat and Power (CHP) to modern California greenhouses that have non-concurrent needs for carbon dioxide (CO₂) and heat, and have minimal demand for electricity onsite.

Barriers, knowledge gaps and technical deficiencies of the subject technology include:

- CHP and thermal energy storage sizing and integration for greenhouses in California coastal climate
- Maximizing heat recovery for highest overall efficiency
- Operating and dispatch strategies for best economic performance
- Obtaining grid interconnect agreement for export under new Rule 21 protocol
- Executing Power Purchase Agreement with Pacific Gas and Electric Company (PG&E)
- Exhaust cleanup sufficient to meet Santa Barbara County Air Pollution Control District (APCD), California Air Resources Board (CARB) 07 Nitrogen Oxide (NOx) for AB 1613 Feed-in-tariff (FIT), and to protect the plants from any harmful exhaust products
- Blending of waste (stranded) gas with natural gas while maintaining CARB 07 NOx emissions

Goals of the Agreement:

The goal of this Agreement is to assess, design and demonstrate the economical operation of CHP in a state-of-the-art greenhouse.

Objectives of the Agreement:

The objectives of this Agreement are to quantitatively measure the technical performance of an optimal CHP integrated greenhouse that includes maximum heat recovery, and low heat loss thermal storage. The objectives include an assessment of economic performance on a going forward basis that takes into account future capital cost improvements, shortening the time to a grid interconnection agreement, and the workability of the just implemented standard Power Purchase Agreement (PPA) with PG&E.

Exhibit A WORK STATEMENT

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 Commission Agreement Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Agreement Manager, Agreement Administrator, Accounting Officer, and others designated by the Commission Agreement 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 Agreement 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:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6) No work may be done until this documentation is in place.
- Permit documentation (Task 1.7)
- Discussion of subcontracts needed to carry out project (Task 1.8)

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

- The Commission Agreement Manager’s expectations for accomplishing tasks described in the Work Statement
- 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 the Final Report (Task 1.5)

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

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Commission Agreement Manager Product:

- Kick-Off Meeting Agenda

Exhibit A WORK STATEMENT

Task 1.2 Critical Project Review (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 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. The Commission Agreement Manager may schedule CPRs as necessary, and CPR costs will be borne by the Recipient.

Participants include the Commission Agreement Manager and the Recipient and may include the Commission Grants Officer, other Energy Commission staff and Management as well as other individuals selected by the Commission Agreement Manager to provide support to the Energy Commission.

The Commission Agreement 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 section 8 of 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:

- 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 products identified in this work statement. The Recipient shall submit these documents to the Commission Agreement 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.

Exhibit A WORK STATEMENT

Commission Agreement Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

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 Commission Grants Office Officer, and the Commission Agreement 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 Agreement 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 Commission Agreement Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Agreement Manager and the 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
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Exhibit A WORK STATEMENT

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities

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.

The Recipient shall:

- Prepare a Monthly Progress Report to 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 Commission Agreement Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in Section 6 of the Terms and Conditions of this Agreement.

Product:

- Monthly Progress Reports

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 objectives of the Final Report are to clearly and completely describe the project's purpose, approach, activities performed, results, and advancements in science and technology; to present a public assessment of the success of the project as measured by the degree to which goals and objectives were achieved; to make insightful observations based on results obtained; to draw conclusions; and to make recommendations for further projects and improvements to the Energy Commission's project management processes.

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.

Exhibit A WORK STATEMENT

The Recipient shall:

- Prepare an Outline of the Final Report.
- Prepare a Final Report following the approved outline and the latest version of the Final Report guidelines which will be provided by the Commission Agreement Manager. The Commission Agreement Manager shall provide written comments on the Draft Final Report within fifteen (15) working days of receipt. The Final Report must be completed at least 60 days before the end of the Agreement Term.
- Submit one bound copy of the Final Report with the final invoice.

Products:

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

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 Energy Commission 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 Energy Commission 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 shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. 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. 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 Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.

Exhibit A WORK STATEMENT

- 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. For match funds provided by a grant a copy of the executed grant shall be submitted in place of a letter of commitment.
- 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 Commission Agreement Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Agreement 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.

Products:

- A letter regarding match funds or stating that no match funds are provided
- Copy(ies) of each match fund commitment letter(s) (if applicable)
- Letter(s) for new match funds (if applicable)
- Letter that match funds were reduced (if applicable)

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 Energy Commission 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 expenditure 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 Commission Agreement 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 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

Exhibit A WORK STATEMENT

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 Commission Agreement Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Agreement Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Agreement Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

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

Task 1.8 Obtain and Execute Subcontracts

The goal of this task is for Recipients to identify any subcontracts required to carry out the tasks under this Agreement and to procure them consistent with the terms and conditions of this Agreement and the Recipient's own procurement policies and procedures. It will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, that the budgeted expenditures are reasonable and consistent with applicable cost principles.

The Recipient shall:

- Prepare a letter documenting the subcontracts required to conduct this Agreement, and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If there are no subcontracts required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that subcontracts will be required during the course of the Agreement, provide in the letter:
 - A list of the subcontracts that describes the anticipated maximum budget and general work statement for each,
 - A description of the procurement process to be used, and
 - The schedule the Recipient will follow in applying for and obtaining these subcontracts.

Exhibit A WORK STATEMENT

- Submit a draft of the subcontract that will include a budget with the information required in the budget details to the Commission Agreement Manager for review and approval, and incorporate any changes recommended by the Commission Agreement Manager.
- Submit a final copy of the executed subcontract.

Products:

- Letter describing the subcontracts needed, or stating that no subcontracts are required
- Draft subcontracts
- Final subcontracts

TECHNICAL TASKS

TASK 2 FUNCTIONALITY REQUIREMENTS

The goal of this task is to develop a set of functional requirements for the CHP system which will serve as the basis for the design.

The Recipient shall:

- Document the effect of temperature and CO₂ on tomato production.
- Provide thermal, electrical and CO₂ load profiles from historical data and projected growth over the build-out period.
- Specify maximum allowable NO_x and hydrocarbon concentrations in the greenhouse and in the engine exhaust to ensure product integrity.
- Confirm the thermal storage system is sized adequately and operates at proper temperature conditions.
- Delineate the operating strategy for optimal CHP performance.
- Prepare a Functional Requirements Report including information obtained in this task.

Products:

- Draft Functional Requirements Report
- Final Functional Requirements Report

TASK 3 PRELIMINARY DESIGN

The goal of this task is to develop a preliminary design of the CHP system and the interfaces with the greenhouse, greenhouse controls, thermal storage tank and PG&E grid.

The Recipient shall:

- Confirm sizing based on CHP/thermal storage system functional requirements.
- Develop single line process flow and electrical diagrams.

Exhibit A WORK STATEMENT

- Provide a preliminary mass and energy balance.
- Ascertain air permit and AB32 requirements.
- Develop a preliminary sequence of operation.
- Identify major equipment and obtain specification documents.
- Develop a preliminary capital cost estimate and economic analysis.
- Agree in principle with PG&E on grid interconnection agreement including documentation of tie-in discussions and costs.
- Prepare a Preliminary Design Report including information obtained in this task.

Products:

- Draft Preliminary Design Report
- Final Preliminary Design Report

TASK 4 DETAILED DESIGN

The goal of this task is to design mechanical, electrical and structural systems that integrate and control the engine generator operating schedule, the pumps, fans, thermal storage tank, and emission control equipment with the balance of the greenhouse systems.

The Recipient shall:

- Specify all equipment in detail.
- Prepare construction ready design drawings.
- Prepare bill of materials.
- Develop sequence of operation.
- Apply for APCD & City permits and obtain all necessary Permits to Construct.
- Execute grid interconnection agreement and power purchase agreement.
- Prepare a Design Report including information obtained in this task.

Products:

- Draft Design Report
- Final Design Report

TASK 5 PROCUREMENT, INSTALLATION AND COMMISSIONING

The goal of this task is to procure the specified equipment, construct the plant per the design intent, and to commission the system after start-up.

The Recipient shall:

- Procure long-lead items. This could occur in parallel with Task 4 once risks have been adequately addressed.
- Purchase remaining equipment and materials and commence construction to be site ready for the major equipment upon arrival.

Exhibit A WORK STATEMENT

- Complete construction and start-up of the CHP system.
- Prepare a Commissioning Plan and commission the plant to ensure that performance is as expected and that all controls perform according to the sequence of operation.
- Prepare Construction Progress Reports to be included in the Monthly Progress Reports.
- Prepare a Commissioning Report including information obtained in this task.

Products:

- Construction Progress Reports to be included in the Monthly Progress Reports (no draft)
- Draft Commissioning Plan
- Final Commissioning Plan
- Draft Commissioning Report
- Final Commissioning Report

TASK 6 PERFORMANCE MONITORING

The goal of this task is to instrument the system and measure system and component technical performance over a 9 month period.

The Recipient shall:

- Prepare a Test Plan that monitors:
 - System efficiency including thermal recovery and utilization
 - Electrical production and parasitic power consumption
 - Availability
 - Natural gas fuel
 - Emissions
 - Fuel costs
 - Energy cost savings
 - Operating and Maintenance costs
- Procure and install instrumentation and data logger.
- Monitor, collect and analyze data.
- Report summary finding in Monthly Progress Reports.
- Prepare a Performance Monitoring Report on technical performance, air and GHG emissions, and economics.

Products:

- Draft Test Plan
- Final Test Plan
- Draft Performance Monitoring Report
- Final Performance Monitoring Report

Exhibit A WORK STATEMENT

TASK 7 MARKET TRANSFER ACTIVITIES

The goal of this task is to communicate the results of the benchmarking design and demonstration to interested parties in CHP, engineering, farming, utility and education communities.

The Recipient shall:

- Prepare a Technology Market Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public.
- Conduct technology transfer activities in accordance with the Technology Market Transfer Plan. These activities shall be reported in the Monthly Progress Reports.

Products:

- Draft Technology Transfer Plan
- Final Technology Transfer Plan