

GRANT REQUEST FORM (GRF)New Agreement EPC-14-047 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Kevin Uy	43	916-327-1533

Recipient's Legal Name	Federal ID Number
Southern California Gas Company	95-1240705

Title of Project
Dairy Waste-to-Bioenergy via the Integration of Concentrating Solar Power and a High Temperature Conversion Process

Term and Amount	Start Date	End Date	Amount
	4/15/2015	12/31/2018	\$ 1,494,736

Business Meeting Information
 ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	4/8/2015	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Kevin Uy	Time Needed:	5 minutes

Please select one list serve. Select

Agenda Item Subject and Description

Proposed resolution approving Agreement EPC-14-047 with the Southern California Gas Company (SoCalGas) for a \$1,494,736 grant to demonstrate the integration of a combined concentrating solar power and a high temperature processing technology which converts dairy manure into low-carbon, high-quality renewable natural gas (RNG) suitable for electricity production.

California Environmental Quality Act (CEQA) Compliance

- Is Agreement considered a "Project" under CEQA?
 - Yes (skip to question 2) No (complete the following (PRC 21065 and 14 CCR 15378)):
 - Explain why Agreement is not considered a "Project":
 - Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because
- If Agreement is considered a "Project" under CEQA:
 - a) Agreement **IS** exempt. (Attach draft NOE)
 - Statutory Exemption. List PRC and/or CCR section number: _____
 - Categorical Exemption. List CCR section number: 14 CCR 15303
 - Common Sense Exemption. 14 CCR 15061 (b) (3)
 - Explain reason why Agreement is exempt under the above section:

14 CCR 15303 New Construction or Conversion of Small Structures

This project will demonstrate a combined concentrating solar power and hydrothermal processing technology which converts dairy manure into low-carbon, pipeline-quality renewable natural gas (RNG) and will not significantly disturb the environment. The site is already developed, is not on agricultural land, and has an existing Hyperlight concentrated solar power (CSP) system on it. No trenching will occur.

This project will involve upgrading the receiver on the existing Hyperlight CSP system and integrating the system with the fabricated bench-scale hydrothermal processing (HTP) system and a small onsite generator.

The project will involve a minimal amount of construction activity. No grading will be involved. The skid-mounted system may be placed directly on the ground or it is possible that a small (10' X 40' or 20' X 20') concrete pad will be poured. This minimal construction is well within the size limits listed in the 14 CCR 15303 exemption examples (e.g., it is less than a single-family residence, duplex, and the 2,500 square feet – or 10,000 square feet in urban areas – for a store, motel, office, restaurant, or similar structure).
 - b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)

Check all that apply

GRANT REQUEST FORM (GRF)



- | | |
|---|---|
| <input type="checkbox"/> Initial Study | <input type="checkbox"/> Environmental Impact Report |
| <input type="checkbox"/> Negative Declaration | <input type="checkbox"/> Statement of Overriding Considerations |
| <input type="checkbox"/> Mitigated Negative Declaration | |

List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)	
Legal Company Name:	Budget
Hyperlight Energy	\$ 721,736
Genifuel Corporation	\$ 99,000
National Renewable Energy Laboratory (NREL)	\$ 99,000
Energy Solutions International	\$ 75,000
	\$
	\$
	\$
	\$
	\$

Exhibit A Scope of Work

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2	X	Design and Fabrication
3	X	System Integration, Operations, and Analysis
4		Evaluation of Project Benefits
5		Technology/Knowledge Transfer Activities
6		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CSP	Concentrated Solar Power
Energy Commission	California Energy Commission
G1, G2, etc.	Goal #1, Goal #2, etc.
HCE	Heat Collection Element
HTP	Hydrothermal Processing
O1, O2, etc.	Objective #1, Objective #2, etc.
RECs	renewable energy credits
RFP	Request for Proposals
RNG	Renewable Natural Gas
SoCalGas	The Southern California Gas Company
TAC	Technical Advisory Committee

I. PURPOSE OF AGREEMENT, PROBLEM/SOLUTION STATEMENT, AND GOALS AND OBJECTIVES

A. Purpose of Agreement

The purpose of this Agreement is to fund an innovative, bench-scale waste-to-energy bioenergy system that converts dairy manure into low-carbon, high-quality renewable natural gas (RNG) suitable for energy applications including distributed electricity production via internal combustion engines, microturbines and fuel cells or larger, centralized electricity production via combined cycle power plants.

¹ Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

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B. Problem/ Solution Statement

Problem

Because of the intermittent nature of many renewable energy sources, special attention must be taken when connecting them to the electrical grid. Energy storage technologies have the potential to increase the reliability of California's energy supply, as well as the ability to dispatch renewable energy sources on demand instead of upon production. Yet, traditional forms of energy storage are often prohibitively costly and lack mature mechanisms for participation in electricity markets.

This project presents a potential cost-effective solution to the challenge of renewable energy storage in California. Yet, because the Concentrated Solar Power (CSP) and Hydrothermal Processing (HTP) technologies have never before been combined, important challenges still remain to be resolved before an integrated system can be commercialized. Chief among these challenges is the need to find the range of operating conditions that will produce optimal yields of RNG for electricity production relative to the bio-crude by-product. This approach has not yet been attempted by other entities because, prior to recent advances in HTP and the development of the low-cost solar steam generator, the proposed process would have been too costly. The potential for a lower-cost solution combined with California's aggressive renewable energy goals and the increasing challenge of stringent dairy waste discharge rules make today the ideal moment to address the challenges discussed above.

Solution

The Recipient will integrate CSP and HTP into a single, integrated system; confirm that it can convert dairy manure into RNG and by-products (e.g. bio-crude), with the RNG to be used for electricity production; study the economics of integrated CSP-HTP systems sited at dairy farms; and confirm that the RNG produced is of high-quality and suitable for efficient, clean conversion into electricity. In this way, the Recipient anticipates proving that it is possible to convert the energy contained in dairy manure waste in a manner that enables California to produce readily dispatchable, ultra-low-emissions renewable electricity.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- **G1)** Prove that HTP can be used to convert dairy manure into pipeline-quality RNG suitable for storage in geological storage facilities, where it can be converted into electricity on demand;
- **G2)** Reduce handling and transportation costs associated with electricity generation.

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Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater renewable energy reliability, lower costs, and increased safety by: 1) eliminating the need for onsite energy storage, thus reducing the capital cost of waste-to-energy biopower systems and improving on-farm biopower system safety; 2) reducing handling and transportation costs associated with electricity generation; 3) reducing the carbon intensity of electricity produced in California; 4) stabilizing the electric power grid by adding to the renewable resource base used by natural gas plants to stabilize the grid today; 5) further stabilizing the electric power grid by addressing the duck curve as solar power goes offline in the late afternoon; and 6) improving service reliability by adding RNG to the resource base used to fuel dispatchable power that comes online to firm up power when solar or wind are under-producing due to weather patterns and/or other planned or unplanned generator outages.

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by researching and developing a promising solution to the need to cost-effectively store renewable energy and to address the "duck curve." If successful and commercialized, the proposed technology could help transform a vast waste stream—dairy manure—into an easily usable commodity, RNG, that is suitable for distributed electricity production via internal combustion engines, microturbines, and fuel cells or larger, centralized electricity production via combined cycle power plants—among the cleanest and most efficient ways to produce electricity from natural gas. At commercial-scale, this approach would reduce the environmental footprint of natural gas "peaker" plants that have to come online daily to mitigate the "duck curve" that continues to worsen as more and more solar power is added to the grid.

Agreement Objectives

The objectives of this Agreement are to:

- **O1)** Design, build, and install an integrated, bench-scale waste-to-bioenergy system that combines an upgraded concentrated solar steam generator from with a HTP system;
- **O2)** Process dairy manure into RNG and by-products (e.g. bio-crude) for a 12-month operations period;
- **O3)** Verify that the RNG meets natural gas standards for pipeline transmission and storage in existing geological storage facilities;
- **O4)** Produce small quantities of electricity using an onsite generator;
- **O5)** Determine the operating conditions that produce optimal yields of RNG;
- **O6)** Explore the economic benefits and challenges of integrated CSP-HTP systems sited at farms

² California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

³ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

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- **O7)** Explore replicating the policy and administrative structure and physical infrastructure of the existing SoCalGas Schedule G-TBS, Transaction Based Storage Service, utility rate tariff for use with RNG.

II. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. Products that require a draft version are indicated by marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, “**days**” means working days.

The Recipient shall:

For products that require a draft version

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Submit the final product to the CAM once agreement has been reached on the draft. The CAM will provide written approval of the final product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- If the CAM determines that the final product does not sufficiently incorporate his/her comments, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For products that require a final version only

- Submit the product to the CAM for approval.
- If the CAM determines that the product requires revision, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

- **Electronic File Format**

Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission’s software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick or CD-ROM.

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The following describes the accepted formats for electronic data and documents provided to the Energy Commission as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- ***Software Application Development***
Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
 - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
 - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
 - Visual Studio.NET (version 2008 and up). Recommend 2010.
 - C# Programming Language with Presentation (UI), Business Object and Data Layers.
 - SQL (Structured Query Language).
 - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
 - Microsoft SQL Reporting Services. Recommend 2008 R2.
 - XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the Energy Commission's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

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

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The Recipient shall:

- Attend a “Kick-off” meeting with the CAM, the Commission Agreement Officer (CAO), and any other Energy Commission staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The administrative portion of the meeting will include discussion of the following:

- Terms and conditions of the Agreement;
- Administrative products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
 - An updated Project Schedule;
 - Technical products (subtask 1.1);
 - Progress reports and invoices (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide an *Updated Project Schedule*, *List of Match Funds*, and *List of Permits*, as needed to reflect any changes in the documents.

The CAM shall:

- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

Recipient Products:

- Updated Project Schedule (*if applicable*)
- Updated List of Match Funds (*if applicable*)
- Updated List of Permits (*if applicable*)

CAM Product:

- Kick-off Meeting Agenda

Exhibit A Scope of Work

Subtask 1.3 Critical Project Review (CPR) Meetings

The goal of this subtask is to determine if the project should continue to receive Energy Commission funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the Energy Commission and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient, and may include the CAO and any other individuals selected by the CAM to provide support to the Energy Commission.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the Energy Commission, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda

Exhibit A Scope of Work

- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any state-owned equipment.
 - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
 - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the 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 *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written Products

Exhibit A Scope of Work

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - Summarize all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
 - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.

- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions. In addition, each invoice must document and verify:
 - Energy Commission funds received by California-based entities;
 - Energy Commission funds spent in California (*if applicable*); and
 - Match fund expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

Recipient Products:

- Final Report Outline (draft and final)

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CAM Product:

- Style Manual

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Products:

- Final Report (draft and final)

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of Energy Commission funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. 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 this 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 cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
 - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the 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 must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.

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- A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter
- Supplemental Match Funds Notification Letter (*if applicable*)
- Match Funds Reduction Notification Letter (*if applicable*)

Subtask 1.8 Permits

The goal of this subtask 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, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
 - The schedule the Recipient will follow in applying for and obtaining the permits.

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project 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 progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

- Permit Status Letter
- Updated List of Permits (*if applicable*)
- Updated Schedule for Acquiring Permits (*if applicable*)

Exhibit A Scope of Work

- Copy of each Approved Permit (*if applicable*)

Subtask 1.9 Subcontracts

The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of the executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

- Subcontracts (*draft if required by the CAM*)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
 - Technical area expertise;
 - Knowledge of market applications; or
 - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

The TAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter;

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- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings

The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC meeting.
- Organize and lead TAC meetings in accordance with the TAC Meeting Schedule. Changes to the schedule must be pre-approved in writing by the CAM.
- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

Products:

- TAC Meeting Schedule (draft and final)

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- TAC Meeting Agendas (draft and final)
- TAC Meeting Back-up Materials
- TAC Meeting Summaries

Exhibit A Scope of Work

III. TECHNICAL TASKS

TASK 2 Design and Fabrication

The goals of this task are to design and build the skid-mounted, bench-scale HTP system and the upgrade to the solar steam generator receiver unit at the existing facility, or appropriate alternative site approved by the CAM.

TASK 2.1 Design of Bench-Scale HTP System

The goal of this subtask is to design the skid-mounted, bench-scale HTP system and issue a Request for Proposals (RFP).

The Recipient shall:

- Create *HTP Design Specifications* for the skid-mounted HTP system
- Prepare *HTP Design/Fabrication Bid Package and RFP*
- Issue RFP, review responses, and select California-based design/fabrication contractor
- Complete civil, structural, process, mechanical, and electrical design and engineering for the skid-mounted, bench-scale HTP system
- Generate *Design and Engineering Packages* for the HTP System
- Prepare *HTP Construction and Equipment Lists* documenting the comprehensive fabrication/construction costs. The Construction and Equipment List will include all items to be purchased, constructed, or installed on the project. For each item, the letter shall provide:
 - The name of the item
 - The make, model, size, capacity or other information as appropriate to the item
 - The name of the entity that will be carrying out the purchase and/or supply or installation of the item
 - The estimated or bid cost to purchase and install the item

Products:

- HTP Design Specifications
- HTP Design/Fabrication Bid Package and RFP
- Design and Engineering Packages
- HTP Construction and Equipment Lists

TASK 2.2 Design of Receiver Upgrade

The goal of this subtask is to develop a feasible conceptual design of a high-temperature receiver that is able to meet specific system upgrade targets such as operating temperature, thermal efficiency, and cost.

The Recipient shall:

- Prepare system requirements for the high-temperature receiver design in *Receiver Upgrade System Requirements* document
- Refine/develop a hybrid modeling tool on solar optics, non-imaging optics, thermal analysis, chemical reaction, and economic analysis to fulfill the design needs
- Conduct optimal design by examining the system design degrees of freedom against receiver techno-economic criteria
- Produce *Receiver Upgrade Design Package*
- Participate in a CPR Meeting #1

Exhibit A Scope of Work

- Prepare a *CPR Report #1*

Products:

- Receiver Upgrade System Requirements
- Receiver Upgrade Design Package
- CPR Report #1

TASK 2.3 Fabrication of Bench-Scale HTP System

The goals of this task are to fabricate the skid-mounted, bench-scale HTP system and the upgrade to the solar steam generator receiver unit at the existing facility.

The Recipient shall:

- Procure all required equipment and materials for system fabrication
- Fabricate skid-mounted HTP system in accordance with HTP Construction and Equipment Lists. System components and materials include:
 - Liquid/gas separator
 - Oil/water separator
 - Valves
 - Oil collection tank
 - Effluent water collection tank
 - Gasification catalyst
 - Tubing and fittings
 - Miscellaneous wiring, clamps, hangers, and trays
 - Process sensors
 - Continuous gas chromatograph
 - Programmable Logic Controller
 - Insulating covers and wraps
 - Skid
- Develop *Bench-Scale HTP System Test Plan* that describes test objectives, procedures, conditions, facilities, and equipment
- Conduct HTP testing in accordance with Bench-scale HTP System Test Plan
- Refine system as needed
- Prepare *Bench-Scale HTP System Test Report*

Products:

- Bench-Scale HTP System Test Plan
- Bench-Scale HTP System Test Report

TASK 2.4 Fabrication of Receiver Upgrade

The goals of this subtask are to fabricate the new receiver design and perform an in-house test.

The Recipient shall:

- Acquire materials and components specified in the Receiver Upgrade Design Package
- Develop a fabrication platform and a *Detailed Fabrication/Assembly Plan*
- Follow the *Detailed Fabrication/Assembly Plan* to assemble all components of the receiver upgrade, including:
 - External Housing
 - Insulation
 - Secondary reflector

Exhibit A Scope of Work

- Heat Collection Element (HCE)
- HCE mounts
- Develop *Receiver Upgrade Test Plan* that describes test objectives, procedures, conditions, facilities, and equipment
- Conduct receiver upgrade testing in accordance with Receiver Upgrade Test Plan
- Refine the receiver design if needed
- Prepare *Receiver Upgrade Test Report*

Products:

- Detailed Fabrication/Assembly Plan
- Receiver Upgrade Test Plan
- Receiver Upgrade Test Report

TASK 3 System Integration, Operations, and Analysis

The goals of this task are to perform system integration of the HTP system, the upgraded receiver, and the existing CSP array at the facility and to start up the new system.

TASK 3.1 System Installation, Integration, and Startup

The goals of this task are to perform system integration of the HTP system, the upgraded receiver, and the existing CSP array at the facility and to start up the new system.

The Recipient shall:

- Develop proposed *Installation Timeline* running from the intended date to begin installation until the commercial operation date of the project
- Execute installation of the project as outlined in the Installation Timeline and HTP Construction and Equipment Lists. This installation shall include the following major components:
 - Layout
 - Civil and Site Work
 - Installation of skid-mounted HTP system
 - Installation of upgraded receiver
 - Installation of a small generator
 - Performance of individual component-level testing
 - Performance of system-level testing (integration testing)
- Conduct:
 - Process Hazard Analysis
 - Pre-Startup Safety Review
- Conduct training for operational personnel
- Develop *Integration Test Plan* that describes system performance testing and includes test objectives, procedures, conditions, facilities, and equipment
- Execute integration test plan in accordance with *Integration Test Plan*
- Startup and commission plant
- Prepare a *Written Notification of Bench-Scale Operation* and submit it to the Commission Project Manager within ten working days of commercial operation of the project. The Written Notification shall contain the following elements:
 - The date the project achieved bench-scale operation(s)
 - A narrative on the current status of the project and initial operations
 - Any changes made from the project as originally proposed and reasons for those changes.

Exhibit A Scope of Work

- Participate in a CPR Meeting #2
- Prepare *CPR Report #2*

Products:

- Installation Timeline
- Integration Test Plan
- Written Notification of Bench-Scale Operation
- CPR Report #2

TASK 3.2 System Operations

The goals of this task are to operate the bench-scale facility as designed for 12 months (unless a shorter timeframe is approved in writing by the CAM) and to collect data to document the project's fulfillment of its objectives.

The Recipient shall:

- Operate facility and comply with all applicable regulatory standards
- Prepare *Operational Test Plan*. This plan will include, among other things:
 - Lab-testing quality of RNG and suitability for:
 - Use in an onsite generator for electricity production
 - Storage in geological storage facilities to allow the use of RNG for generation during periods of peak demand or to add to resources for stabilization of intermittent power from wind and solar.
 - Conversion of RNG into electricity using small, onsite generator
- Execute *Operational Test Plan*
- Collect operational data and provide CEC with ongoing, real-time access to system data
- Prepare an *Operations Summary Report* which summarizes twelve months of operational data.
- Monthly operations will be summarized in Progress Reports (see Subtask 1.5) which shall include but are not be limited to the following information:
 - A narrative on operational highlights from the previous month, including any stoppages in production and a statement as to the project's compliance with regulatory requirements.
 - The total amount of products produced on a monthly basis. Products include:
 - Electricity production from onsite generator
 - Test quantities of RNG injected into the nearby SoCalGas pipeline and equivalent in electricity production
 - RNG
 - Bio-crude by-product
 - The total amount of dairy manure received and processed on a monthly basis
 - Conversion ratios for manure to RNG and bio-crude by-product production and dairy manure to electricity
 - The direct operational costs of the project

Products:

- Operational Test Plan
- Operations Summary Report (Draft and Final)

Exhibit A Scope of Work

TASK 3.3 Economic Impact Analysis

The goals of this task are to perform economic evaluation and impact analysis of the proposed technology at bench and commercial scale.

The Recipient shall:

- Explore market mechanisms that may enable the use of existing geological storage facilities as energy storage.
- Explore innovative new market mechanisms that may enable the use of existing natural gas pipelines as energy storage for electricity production using RNG fuel during periods of peak demand and thereby reducing emissions, or to stabilize intermittent sources of electricity.
- Research potential value add/revenue stream from renewable energy credits (RECs) to incentivize third-party project finance providers to bring more RNG projects using this technology online sooner, lowering emissions and stabilizing the grid.
- Study the relationship between the proposed system and:
 - Water discharge requirements from dairy facilities
 - Water consumption at dairy/farm and savings opportunities
 - Water savings from reduced fossil fuel generation
 - The economic benefit of drawing down RNG from gas storage for electric generation to provide smoothing for intermittent sources such as wind and solar. This would benefit ratepayers by allowing more use of such sources without destabilizing the grid.
- Prepare an *Economic Modeling and Impact Analysis Report*.

Products:

- Economic Evaluation and Impact Analysis Report (Draft and Final)

TASK 4 Evaluation of Project Benefits

The goal of this task is to report the benefits resulting from this project.

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
 - For Product Development Projects and Project Demonstrations:
 - Published documents, including date, title, and periodical name.
 - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
 - Greenhouse gas and criteria emissions reductions.
 - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.

Exhibit A Scope of Work

- Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

Exhibit A Scope of Work

TASK 5 Technology/Knowledge Transfer Activities

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, members of disadvantaged communities and others. Outreach may include;
 - Signage with project team and Energy Commission logos
 - Press releases
 - Legislative and Energy Commission tours
 - School tours
 - A description of the intended use(s) for and users of the project results.
 - Published documents, including date, title, and periodical name.
 - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
 - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
 - The number of website downloads or public requests for project results.
 - Additional areas as determined by the CAM.
 - Social media plan to reach farmers, policy makers, investor owned utilities, and other stakeholders.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

Exhibit A Scope of Work

TASK 6 Production Readiness Plan

The goal of this task is to determine the steps that will lead to the manufacturing of technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:
 - Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
 - Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."
 - The estimated cost of production.
 - The expected investment threshold needed to launch the commercial product.
 - An implementation plan to ramp up to full production.
 - The outcome of product development efforts, such as copyrights and license agreements.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Other areas as determined by the CAM.
 - Marketing plans

Products:

- Production Readiness Plan (draft and final)

Exhibit A Scope of Work

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: SOUTHERN CALIFORNIA GAS COMPANY

RESOLVED, that the State Energy Resources Conservation and Development Commission (Energy Commission) adopts the staff CEQA findings contained in the Agreement Request Form; and

RESOLVED, that the Energy Commission approves Agreement EPC-14-047 from PON-14-303 with the **Southern California Gas Company** for a **\$1,494,736** grant to demonstrate the integration of a combined concentrating solar power and a high temperature processing technology which converts dairy manure into low-carbon, high-quality renewable natural gas suitable for electricity production; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her designee shall execute the same on behalf of the Energy Commission.

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on April 8, 2015.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Harriet Kallemeyn,
Secretariat