

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION

New Agreement PIR-14-018 (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 |
|--|-------------------|
| Institute of Gas Technology dba Gas Technology Institute | 36-2170137 |

| Title of Project |
|---|
| Showcase Field Demonstrations of a 25 kWe Low-Emission Reciprocating Engine CHP System at the SoCal Gas |

| Term and Amount | Start Date | End Date | Amount |
|-----------------|------------|------------|------------|
| | 6/30/2015 | 12/31/2017 | \$ 562,820 |

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

| | | | |
|--------------------------------|-----------|----------------------------------|--|
| Proposed Business Meeting Date | 5/27/2015 | <input type="checkbox"/> Consent | <input checked="" type="checkbox"/> Discussion |
| Business Meeting Presenter | Kevin Uy | Time Needed: | 5 minutes |

Please select one list serve. NaturalGas (NG Research Program)

Agenda Item Subject and Description

INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE. Proposed resolution approving Agreement PIR-14-018 with Institute of Gas Technology dba Gas Technology Institute for a \$562,820 grant to fund a laboratory- and pilot-scale demonstration of an Air Resources Board-compliant prepackaged 25 kilowatt low-emission, reciprocating engine-based Combined Cooling Heating and Power system.

California Environmental Quality Act (CEQA) Compliance

1. 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
2. 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, 14 CCR 15306
 Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why Agreement is exempt under the above section:
 This project involves two units of 25 kWe low-emission reciprocating engine micro-combined heat and power system. Each unit incorporates an internal combustion engine and an induction generator packaged with a heat distribution heat exchange, a power distribution panel, and post combustion NOx reduction system. This project first involves feasibility testing at a location in Pico Rivera and then a demonstration installation at the Southern California Case Energy Resource Center in Downy, California. The feasibility testing involves a paper-based analyses and laboratory testing. The demonstration involves a modest modification to an existing building, with no anticipated significant environmental impacts to air quality, biology, agriculture, traffic or noise. South Coast Air Quality Management District requires engines to be at least 50 hp or larger to necessitate a permit, and the two units proposed for this project are below this requirement.
- b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
- | | |
|---|---|
| <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 |
|--------------------------|-----------|
| Davis Energy Group, Inc. | \$ 86,000 |
| Vronay Engineering | \$ 99,000 |
| CDH Energy Corporation | \$ 28,200 |
| | \$ |

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CALIFORNIA ENERGY COMMISSION



| |
|---|
| List all key partners: (attach additional sheets as necessary) |
| Legal Company Name: |
| EC Power |
| Southern California Gas Company |
| |
| |

| Budget Information | | | |
|-----------------------------------|-------------------------------|----------------------|-----------|
| Funding Source | Funding Year of Appropriation | Budget List No. | Amount |
| NG Subaccount, PIERDD | 13-14 | 501.001H | \$562,820 |
| | | | \$ |
| | | | \$ |
| | | | \$ |
| | | | \$ |
| | | | \$ |
| R&D Program Area: | EGRO: Renewables | TOTAL: | \$562,820 |
| Explanation for "Other" selection | | | |
| Reimbursement Contract #: | | Federal Agreement #: | |

| Recipient's Administrator/ Officer | | Recipient's Project Manager | |
|------------------------------------|---------------------------------|-----------------------------|-------------------------------|
| Name: | Kate Jauridez | Name: | Larry Brand |
| Address: | 1700 S MT PROSPECT RD | Address: | 1105 KENNEDY PL STE 5 |
| City, State, Zip: | DES PLAINES, IL 60018-1804 | City, State, Zip: | DAVIS, CA 95616-1272 |
| Phone: | 847-768-0905 / Fax: - - | Phone: | 530 758 2392 / Fax: - - |
| E-Mail: | Kate.Jauridez@gastechnology.org | E-Mail: | Larry.Brand@Gastechnology.org |

| Selection Process Used | |
|---|----------------------------|
| <input checked="" type="checkbox"/> Competitive Solicitation | Solicitation #: PON-14-505 |
| <input type="checkbox"/> First Come First Served Solicitation | |

| The following items should be attached to this GRF | |
|---|---|
| 1. Exhibit A, Scope of Work | <input checked="" type="checkbox"/> Attached |
| 2. Exhibit B, Budget Detail | <input checked="" type="checkbox"/> Attached |
| 3. CEC 105, Questionnaire for Identifying Conflicts | <input checked="" type="checkbox"/> Attached |
| 4. Recipient Resolution | <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached |
| 5. CEQA Documentation | <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached |

| | | | | | |
|----------------------------|---------------|-------------------------|---------------|--------------------------|---------------|
| _____ Agreement Manager | _____ Date | _____ Office Manager | _____ Date | _____ Deputy Director | _____ Date |
|----------------------------|---------------|-------------------------|---------------|--------------------------|---------------|

EXHIBIT A Scope of Work

A. Task List

| Task # | CPR ¹ | Task Name |
|--------|------------------|--|
| 1 | | General Project Tasks |
| 2 | | Feasibility Study |
| 3 | X | Laboratory Test and Deployment Site Contract |
| 4 | | Engineering Study |
| 5 | | Detailed Engineering |
| 6 | X | Installation and Commissioning |
| 7 | | Measurement and Verification |
| 8 | | Evaluation of Project Benefits |
| 9 | | Technology/Knowledge Transfer Activities |

B. Acronym/Term List

| Acronym/Term | Meaning |
|--------------|---------------------------------------|
| ARB | Air Resource Board |
| CAM | Commission Agreement Manager |
| CAO | Commission Agreement Officer |
| CCHP | Combined Cooling Heating and Power |
| CHP | Combined Heat and Power |
| CPR | Critical Project Review |
| EAC | SoCal Gas Engineering Analysis Center |
| ERC | SoCal Gas Energy Resource Center |
| Hz | Hertz |
| kW | Kilowatt |
| M&V | Measurement and Verification |
| MCHP | Micro Combined Heat and Power |
| NOx | Oxides of Nitrogen |
| TAC | Technical Advisory Committee |
| V | Volt |

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a laboratory- and pilot-scale demonstration of an Air Resources Board (ARB)-compliant prepackaged 25 kilowatt (kW) low-emission, reciprocating engine-based Combined Cooling Heating and Power (CCHP) system.

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

Reciprocating engine technology likely offers the best near-term opportunity for cost-effective small-scale Combined Heat and Power (CHP). However, there is no commercially available ARB-compliant engine-based technology less than 50 kW available in the market.

Solution

In 2014 EC Power, Inc. developed a beta-level CHP machine by converting an existing 20kW European model and modifying it to operate at 25kW in a 60 Hertz (Hz), 3-phase, 480 Volt (V) environment. The unit incorporates an internal combustion engine along with an induction generator and is designed to operate on- or off-grid with black-start capability electrically- or thermally-led. The CHP unit is prepackaged with a heat distribution heat exchanger and a power distribution panel. The EC Power team also developed a novel post-combustion Nitrogen Oxides (NOx) reduction strategy for the beta machine in order to meet stringent ARB emissions requirements.

The recipient believes this methodology has the potential to cost-effectively reduce exhaust gas NOx below ARB requirements. A laboratory- and pilot-scale demonstration will verify emissions rates under controlled and normal operating conditions. The demonstrations will also identify any penalties in electrical efficiency the process may incur and any advantages in overall efficiencies the process may create.

C. Goals and Objectives of the Agreement

Agreement Goals

The primary goal of this Agreement is to conduct a laboratory- and pilot-scale demonstration of an ARB-compliant prepackaged 25kW low-emission reciprocating engine-based CCHP system.

Ratepayer Benefits:

This agreement will result in economic and environmental benefits to the ratepayers of California, including reducing total energy consumption and criteria pollutant emissions and increasing the reliability of the state's energy supply. Micro-CHP allows for expanded distributed power generation, which reduces ratepayer susceptibility to financial costs and inconveniences associated with power outages. Considering spark-spread and interconnection standards, California is one of the most inviting states in the US for micro-CHP as long as the systems can be CARB-certified. The average retail commercial energy prices from 2011 Department of Energy Information Agency indicates California's electricity rates are five-times those of natural gas on an equivalent unit of energy basis (spark-spread of 5). The majority of states in the US have spark-spreads below 4. Using representative values, the payback for the system is approximately 4.4 years. Conservatively assuming a 10 year life, the cost of the electricity produced is about 25% of the cost of grid electricity in California.

In terms of emissions, this project will result in an engine-driven CCHP technology that meets the ARB requirements. Generating power on site results in lower emissions per kW delivered to the customer.

Security benefits also accrue due to the increased reliability of the electric energy supply associated with on-site power generation.

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Technological Advancement and Breakthroughs:

This Agreement will lead to technological advancements and breakthroughs to overcome barriers to achievement of the State of California's statutory energy goals by supporting the development of reciprocating engine technology that likely offers the best near-term opportunity for cost-effective small-scale CHP. The proposed novel post-combustion NOx reduction strategy is expected to demonstrate viability through this project; it could help lead to technological advancements that break down the barriers to widespread relatively low-cost reciprocating engine-based market penetration in California.

Agreement Objectives

The objectives of this Agreement are to:

- Laboratory pretest a 25kW engine-based CHP system in California to verify ARB-compliancy, electric and thermal production, and efficiencies
- Install a two-unit 50kW CCHP system with heat recovery to an existing solar thermal hot water system at the SoCal Gas Energy Resource Center (ERC) or other test site deemed appropriate by the CAM in writing
- Showcase the CCHP system at the ERC via a kiosk-type demonstration and website display
- Monitor and report performance of the CCHP system for one year following installation at the ERC or a shorter period as deemed appropriate by the CAM in writing

EXHIBIT A

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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.

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.

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- 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.

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);

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- 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

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.

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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
- 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.

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- 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

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.

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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)

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

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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.
- 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.

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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*)
- 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*)

EXHIBIT A Scope of Work

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;
- 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.

EXHIBIT A

Scope of Work

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

EXHIBIT A

Scope of Work

II. TECHNICAL TASKS

TASK 2 FEASIBILITY STUDY

The goals of this task are to (1) secure the Measurement and Verification (M&V) and Engineering subcontractors and (2) conduct a *Feasibility Study* for installing a two-unit 50kW CCHP system at the SoCal Gas ERC or other site deemed appropriate by the CAM in writing, with heat recovery to an existing solar thermal hot water system.

The Recipient shall:

- Execute a *Contract with M&V Consultant* and execute a *Contract with M&V Contractor*, and procure the subcontracts with them under subtask 1.9 and provide a copy to the CAM
- Secure the M&V contractor's services during the project term and confirm contractor will follow the M&V protocol as defined in Task 7
- Execute a *Contract with the Installation Engineering Contractor* and procure the subcontract with them under subtask 1.9 and provide a copy to the CAM
- Secure the engineering contractor's services during the project term
- Confirm each contractor's abilities to provide required hardware, software, and staff to conduct their defined scopes during the project term
- If any of the contractors become unavailable during the project term, the recipient shall follow the terms and conditions when replacing a subcontractor
- Execute a *Cost Share Agreement with SoCal Gas Engineering Analysis Center (EAC)* or other laboratory test site deemed appropriate by the CAM in writing, to pretest a 25kW engine-based CHP system at their laboratory facilities
- Execute a *Cost Share Agreement with EC Power Micro Combined Heat and Power (MCHP) Corp.* to provide two 25kW CHP systems and engineering support
- Secure the ERC existing systems diagrams, power and hot water load data, electric and gas billing data. Manage ERC activity to define utility interconnection requirements
- Identify any available incentives the ERC may apply to for the CCHP installation
- Conduct facility power and hot water load profile analyses
- Develop system sizing and operational schedule
- Prepare project concept diagrams (mechanical, electrical, arrangements)
- Define utility baseline costs
- Refine estimated installation costs
- Manage activity for preparing measurement, verification, and showcase concepts
- Conduct ERC on-site Concept Meeting
- Prepare final technical and economic benefits analysis
- Prepare and provide a *Feasibility Report* which includes but is not limited to:
 - Utility interconnection requirements
 - Facility power and hot water load profile analyses
 - System sizing and operational schedule
 - Project concept diagrams (mechanical, electrical, arrangements)
 - Utility baseline costs
 - Estimated installation costs
 - Measurement, verification, and showcase concepts
 - Final technical and economic benefits analysis

EXHIBIT A

Scope of Work

Products:

- Copy of contract with M&V Consultant
- Copy of Contract with M&V Contractor
- Copy of Contract with Installation Engineering Contractor
- Cost Share Agreement with SoCal Gas EAC
- Cost Share Agreement with EC Power MCHP Corp.
- Feasibility Report (draft and final)

TASK 3 LABORATORY TEST AND DEPLOYMENT SITE CONTRACT

The goals of this task are to (1) secure the deployment site and (2) laboratory pretest a 25kW engine-based CHP system to verify ARB-compliance, electric and thermal production, and efficiencies.

The Recipient shall:

- Reach agreement with the manager(s) of the ERC or other deployment site deemed appropriate by the CAM in writing, regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, contractual, and the recipient's use of support staff
- If the ERC becomes unavailable during the project term, work with the CAM to select a new site
- Execute a *Contract with the Deployment Site* (ERC) that confirms the agreement reached above on and provide a copy to CAM.
- Procure one EC Power CHP system for testing and coordinate delivery to the EAC
- Manage EAC activities including:
 - Development of a *Laboratory Test Plan* that shows instrumentation requirements, accuracy, test set-up, test number, test conditions, and reporting format
 - Test setup by the EAC to conduct:
 - Emissions testing per the ARB Distributed Generation Certification Regulation at the EAC
 - Power and thermal energy production testing at the EAC
 - Performance calculations by the EAC
 - Prepare and provide a *Laboratory Test Report* which includes but is not limited to:
 - Emissions testing results and comparison against ARB regulations
 - Power and thermal energy production test results
 - Performance calculations
- Coordinate proper storage of the test unit for future installation at the ERC
- Prepare and provide *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- Copy of contract with the Deployment Site
- Laboratory Test Plan
- Laboratory Test Report (draft and final)
- CPR Report #1

EXHIBIT A

Scope of Work

TASK 4 ENGINEERING STUDY

The goal of this task is to develop an *Engineering Study* as the basis for detailed development of the mechanical and electrical systems as well as the detailed cost.

The Recipient shall:

- Manage Installation Engineering Contractor's engineering study activities including:
 - Development of project design criteria including system descriptions, equipment specifications, equipment lists, and drawing lists
 - Preparation of equipment location and interconnection diagrams
 - Preparation of process flow and instrumentation diagrams
 - Preparation of electrical 3-line diagrams
- Manage M&V Consultant's and M&V's Contractor's M&V engineering study activities including:
 - Preparation of the instrument point list
 - Preparation of the website plan
 - Preparation of the final M&V plan
- Finalize permitting costs
- Conduct ERC on-site engineering meeting
- Coordinate final engineering cost estimating
- Prepare and provide *Engineering Study* in a report detailing the system description including:
 - Product specifications
 - Equipment lists
 - Drawing lists
 - Location and interconnect diagrams
 - Process flow and instrumentation diagrams
 - Electrical 3 line diagrams

Products:

- Engineering Study (draft and final)

TASK 5 DETAILED ENGINEERING

The goal of this task is to (1) secure the installation subcontractors and (2) develop the *Installation Engineering Package*.

The Recipient shall:

- Manage Installation Engineering Contractor's engineering activities including:
 - Securing utility interconnection agreement
 - Preparing Professional Engineer (PE)-stamped equipment arrangement drawings
 - Preparing PE-stamped piping and piping-support drawings
 - Preparing PE-stamped wiring termination, and conduit drawings
 - Updating equipment specifications
- Manage M&V Consultant's and M&V's Contractor's activities including:
 - Updating the M&V plan
 - Preparing PE-stamped instrumentation installation drawings
 - Developing the M&V website

EXHIBIT A Scope of Work

- Conduct ERC on-site installation engineering meeting
- Prepare and provide the *Installation Engineering Package* that details the installation engineering requirements for the subcontractor
- Execute and provide a copy of a *Contract with Installing Contractor* and procure the subcontract with them under subtask 1.9
- Secure the installing contractor's services during the project term.
- Confirm the installing contractor's ability to provide required material and licensed staff to conduct their defined scope during the project term
- If the installing contractor becomes unavailable during the project term, the recipient shall work with the CAM to select a replacement contractor

Products:

- Installation Engineering Package
- Copy of contract with Installing Contractor

TASK 6 INSTALLATION AND COMMISSIONING

The goal for this task is to install the two-unit 50kW CCHP system at the ERC with heat recovery to an existing solar thermal hot water system in order to showcase the system via a kiosk-type demonstration and display.

The Recipient shall:

- Coordinate delivery to the ERC of the first EC Power system stored at the EAC
- Procure and coordinate delivery of a second EC Power CHP system to the ERC
- Manage Installation Engineering Contractor's installation and commissioning activities including:
 - Installing Contractor management (managed by Installation Engineering Contractor contracted by the recipient)
 - Mechanical/electrical installation
 - Startup and commissioning
 - Preparing an *As-built Drawing Package* and provide to CAM. This package will include but not be limited to:
 - An update of select Engineering Study drawings modified to reflect the actual installation. Potential modifications include slight changes to piping, location and electrical wiring
- Manage M&V Consultant's and M&V's Contractor's installation and commissioning support activities including:
 - Instrumentation installation
 - Startup and commissioning
- Manage the ERC startup and commissioning support
- Prepare and provide a *Commissioning Report* to include:
 - Delivery schedule for the two units
 - Installation Engineering Contractor's installation and commissioning activities
 - M&V Consultants and M&V Contractor's installation and commissioning support activities
 - ERC startup and commissioning report
 - Permits and drawings
- Prepare and provide a *CPR Report #2* in accordance with subtask 1.3
- Participate in a CPR meeting in accordance with subtask 1.3

EXHIBIT A

Scope of Work

Products:

- Commissioning Report
- As-built Drawing Package
- CPR Report #2

TASK 7 MEASUREMENT AND VERIFICATION

The goal of this task is to monitor and report performance of the CCHP system for one year or a shorter period as deemed appropriate by the CAM in writing following installation at the ERC.

The Recipient shall:

- Confirm that M&V Consultant and M&V's Contractor will follow utility M&V protocols, and will prepare a detailed analytical report that verifies natural gas consumption and engineering calculations for natural gas savings
- Manage M&V Consultant and M&V's Contractor M&V activities including:
 - Maintaining instrumentation and data logger integrity
 - Maintaining data collection and data point integrity
 - Reducing data and prepare performance calculations
 - Maintaining website integrity
- Manage the ERC support for the duration of M&V program
- Prepare and provide a *Demonstration Report* documenting and summarizing test, analysis, operational and performance data at conclusion of the measurement and verification period.

Products:

- Demonstration Report

TASK 8 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 natural gas, 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.

EXHIBIT A

Scope of Work

- Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
- 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 has 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.

EXHIBIT A Scope of Work

Products:

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

TASK 9 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, and others.
 - 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.
- 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)

III. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: GAS TECHNOLOGY INSTITUTE

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 PIR-14-018 from PON-14-505 with **Institute of Gas Technology dba Gas Technology Institute** for a **\$562,820** grant to fund a laboratory- and pilot-scale demonstration of an Air Resources Board-compliant prepackaged 25 kilowatt low-emission, reciprocating engine-based combined cooling heating and power system; 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 June 10, 2015.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Harriet Kallemeyn,
Secretariat