

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement FRD-17-001 (To be completed by CGL Office)

ERDD	Pilar Magana	43	916-327-2216
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Biogas Energy Inc.	20-4461752
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Conversion of Wood Biomass to Bio-oil in an Ablative Fast Pyrolysis Reactor

3/26/2018	1/7/2022	\$ 5,700,000
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<input type="checkbox"/> ARFVTP agreements under \$75K delegated to Executive Director.			
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Proposed Business Meeting Date	2/21/2018	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Pilar Magana	Time Needed:	5 minutes
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Please select one list serve. Research (Energy RDD / PIER program)

Agenda Item Subject and Description

BIOGAS ENERGY INC. Proposed resolution approving Agreement FRD-17-001 with Biogas Energy Inc. for a \$5,700,000 grant to install and demonstrate an innovative fast pyrolysis technology to produce bio-oil from wood waste at pilot scale. The Biogas Energy pyrolysis technology aims to establish a new bio-oil industry in California by making small, midsize, and large bio-oil production possible in a distributed or centralized design. Research will also verify the economic scale-up feasibility for the modular system and determine the effectiveness of the production facility to be located near the feedstock source.



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)):

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: Cal. Code Regs., tit 14, § 15301 -- Cal. Code Regs., tit 14, § 15303 and tit 14 §15306.
 Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why Agreement is exempt under the above section:
Existing Facilities 14 CCR § 15301
 Section 15301 Existing Facilities provides an exemption for the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing structures, facilities, mechanical equipment or topographical features involving negligible or no expansion of use beyond that existing. This project will involve minor alteration of an existing organics recycling facility with the installation and operation of a containerized ablative fast-pyrolysis reactor at Western Placer County's Waste Management Authority's existing organics recycling facility. The project will involve negligible or no expansion of use beyond that currently existing. Additionally, the lead agency, Placer County Planning Services Division, also found the project exempt under categorical exemption section 15301 Existing Facilities.
New Construction of Conversion of Small Structures 14 CCR § 15303
 Section 15303 New Construction of Conversion of Small Structures provides an exemption for the construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. This project will involve the construction and location of a 3,000 square foot concrete slab and construction of the containerized ablative fast-pyrolysis reactor on the slab as well as the placement of a temporary modular office trailer on the site. Additionally, the lead agency, Placer County Planning Services Division, also found the project exempt under categorical exemption section 15303 New Construction of Conversion of Small Structures.
Information Collection 14 CCR § 15306
 Section 15306 Information Collection provides that projects which consist of basic data collection, research, experimental management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource are categorically exempt from the provisions of CEQA. This project will involve data collection and analysis which will not result in a serious or major disturbance to an environmental resource.

b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
 Initial Study Environmental Impact Report
 Negative Declaration Statement of Overriding Considerations
 Mitigated Negative Declaration

Legal Company Name:	Budget
SeaHold Limited Liability Company	\$ 20,000
California State University, Chico	\$ 98,000
Joint Bioenergy Institute	\$ 42,000
Bioenergy Concept	\$ 2,220,000
	\$
	\$

Legal Company Name:

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CALIFORNIA ENERGY COMMISSION



Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
GENERAL	16-17	310.001	\$5,700,000
			\$
			\$
			\$
R&D Program Area: EGRO: Transportation			\$5,700,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Name:	Brian Gannon	Name:	Brian Gannon
Address:	1501 Poplar Ave	Address:	1501 Poplar Ave
City, State, Zip:	Richmond, CA 94805-1662	City, State, Zip:	Richmond, CA 94805-1662
Phone:	510-200-3609 /	Fax:	- -
E-Mail:	bgannon@biogas-energy.com	E-Mail:	bgannon@biogas-energy.com

<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: GFO-16-901
<input type="checkbox"/> First Come First Served Solicitation	

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

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		Project Administration
2		Contract Execution
3	X	Equipment Procurement and Manufacturing
4		Equipment Installation and Operation
5	X	Data Collection and Analysis
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities
8		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
M&V	Measurement and Verification
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to fund demonstration of a cost-effective, efficient technology to produce bio-oil from California based feedstocks such as urban, agricultural and forestry waste wood biomass. For purposes of this agreement bio-oil is defined as a synthetic or organic equivalent to crude oil such as bio-crude. The bio-oil will be used for upgrading into a low carbon, fungible vehicle fuel that can be inserted into the existing fueling infrastructure as a diesel replacement or jet fuel.

B. Problem/ Solution Statement

Problem

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

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One hundred million trees in California's forests have died, causing severe fire danger and the potential for significant release of carbon. Several major wood-fired power plants have shut down, creating a glut of wood biomass. This forestry, agricultural, and urban wood biomass has the potential to become low carbon add-in fuel for diesel and jet fuel, but a cost effective, efficient bio-oil processing and production technology has not been perfected.

Fast pyrolysis bio-oil production has struggled in the marketplace because a) the facilities require large-scale deployment and commensurate budgets, b) supply chain costs are too high to compete, and c) supply/demand balance is undetermined due to the early stage of technology deployment: do the refineries invest first and hope for the bio-oil? Or do the pyrolysis projects build themselves before the refineries are ready for them? Without a proven, efficient, scalable-up-or-down solution, wood biomass will not become the in-state, low carbon fuel it should rightly be.

Solution

The Recipient will run a pilot plant demonstrating a proven pyrolysis technology that has successfully generated bio-oil from wood waste for over a decade at lab and pilot scale. This technology uses a groundbreaking rotating heated disk technology to solve the seemingly intractable problems faced by the bio-oil industry today. Scalable down to 12 tons of wood biomass per day, the containerized system can be scaled up to any size simply by adding units. Capital costs for bio-oil projects will be half of what other pyrolysis technologies require, and the system can be deployed in a decentralized strategy to eliminate supply chain costs.

The Recipient's pyrolysis technology will establish a new bio-oil industry in California by making small, midsize, and large bio-oil production possible either in a distributed or centralized fashion. As demand for bio-oil grows from refineries seeking to maximize revenue from the Low Carbon Fuel Standard, projects can expand gradually by adding Recipient's pyrolysis units to save money and reduce risk.

The recipient removes barriers to entry for bio-oil project developers and cuts costs by putting pyrolysis right where the wood waste is generated.

California's 7.7 million acres of dead trees are an ecological disaster but the Recipient's bio-oil process gives the economic impetus to convert that biomass to fuel.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Establish a new pilot-scale wood-biomass-to-bio-oil facility in California that:
 - Uses waste feedstock (e.g. wood from dead trees as a result of drought/beetle infestation);

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- Supplies refineries with bio-oil that can be processed into a drop-in fuel for the existing conventional fuel supply chain;
- Cuts carbon emissions from California's fuel lifecycle; and
- Competes successfully with conventional fuel production processes.

- Customize a fast-pyrolysis technology to fit the California market by:
 - Building a containerized pyrolysis reactor that is scalable and cost-effective;
 - Integrating feedstock management to process a variety of woody biomass; and
 - Generating bio-oil to refinery specifications to make drop-in conventional fuel.

Agreement Objectives

The objectives of this Agreement are to:

- Design and construct a containerized ablative disk fast-pyrolysis reactor that:
 - Processes up to 12 tons/day wood biomass feedstock
 - Produces up to 1,600 gallons/day bio oil
 - Uses self-generated product gas to fuel the pyrolysis process and biomass drying
 - Targets a mass-production pyrolysis unit manufacturing cost of <\$1million
 - Produces an intermediate fuel that is compatible with existing petroleum refineries or biorefineries for converting or upgrading to advanced fungible biofuels
- Operate the pyrolysis reactor successfully by:
 - Testing a variety of regionally-sourced wood biomass which will also determine a set of sustainable reliable biomass sources, utilizing California's organic waste streams
 - Producing and supplying an intermediate bio oil that meets the requirements and standards of California-based refineries. Producing a minimum of 50,000 gallons of a bio-oil intermediate fuel over the project term.
- Determine the most cost-intensive parts of the reactor and make projections on how these costs will change based on a transition from pilot-scale project to a commercial scale project (> 500,000 gallons of intermediate fuel per year) and suggest solutions on how to minimize the costs.
- Develop a strategy for the recycling of solid waste due to the manufacturing process.

III. TASK 1 PROJECT ADMINISTRATION

PRODUCTS

Subtask 1.1 Products

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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.

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

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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

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

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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)

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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.
- 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*)

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- 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 research 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 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.

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- 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 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

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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 reimbursable under this Agreement. 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:

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- 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).

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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 research direction. The guidance may include research scope and methodologies, timing, and coordination with other research. 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 research (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 project research 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 research 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.

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

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IV. TECHNICAL TASKS

*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. **Subtask 1.1 (Products)** describes the procedure for submitting products to the CAM.*

TASK 2: AGREEMENT EXECUTION

The goals of this task are to: (1) confirm the availability of the selected project demonstration site and a measurement and verification (M&V) contractor; and (2) execute any agreements necessary to secure the demonstration site and M&V contractor.

Subtask 2.1 Execute an Agreement with the Selected Demonstration Site

The Recipient shall:

- Reach agreement with the selected demonstration site regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, indemnity, and the Recipient’s use of any removal or support staff, and any other necessary terms and conditions.
- If the selected demonstration site becomes unavailable during the project term, notify the CAM immediately and work with the CAM to select a new site if possible. For any changes to site location, Recipient must check with their CAM or CAO who will provide guidance regarding the level of Energy Commission approval required and must obtain advance written consent from Energy Commission staff before any site change.
- Prepare and provide *Site Readiness Verification Document(s)* (e.g. Copy of Contract, Lease Agreement, Memorandum of Understanding, etc.) documenting the above items.

Products:

- *Site Readiness Verification Document(s)*

Subtask 2.2 Execute a Contract with the Selected Measurement and Verification Contractor

The Recipient shall:

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- Confirm the selected M&V contractor's ability to provide required hardware, software, and staff to conduct the required measurements during the project term.
- Confirm that the selected M&V contractor will follow protocols, and will prepare a detailed *M&V Analytical Report* that verifies energy consumption and engineering calculations for energy and cost savings.
- Execute a contract with the selected M&V contractor documenting the above items.
- If the selected M&V contractor becomes unavailable during the project term, the Recipient shall work with the CAM to select a new M&V contractor.

Products:

- Contract with selected M&V contractor

TASK 3: EQUIPMENT PROCUREMENT AND MANUFACTURING

The goal of this task is to manufacture or procure all equipment necessary for the installation and operation of the pilot plant demonstration of the pyrolysis bio-oil production technology.

The Recipient shall:

- Oversee manufacturing of pyrolysis system.
- Specify and procure all equipment for processing wood biomass.
- Establish laboratory for testing and data collection at demonstration and subcontractor sites including all equipment necessary.
- Conduct weekly status meetings with subcontractors and vendors to ensure the project is on schedule and to discuss any potential issues.
- Prepare *Manufacturing Report* documenting all procured equipment and equipment manufacturing processes, including photographs of procured equipment and manufacturing process.
- Prepare a *CPR Report* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Manufacturing Report
- CPR Report

TASK 4: EQUIPMENT INSTALLATION AND OPERATION

The goal of this task is to install and operate the pilot plant demonstration of the pyrolysis bio-oil production technology system to produce bio-oil from wood biomass.

The Recipient shall:

- Install all equipment, controls, and processes of the system.

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- Commission equipment to operational status.
- Operate the system.
- Receive wood biomass and process in preparation for pyrolysis to produce a minimum of 50,000 gallons of a bio-oil intermediate fuel over the project term.
- Maintain equipment.
- Conduct weekly status meetings with operators, technicians, and managers.
- Supply bio-oil for testing, research, and refining to subcontractors.
- Prepare a *Recycling Strategy Plan* that describes the developed strategy for the recycling of solid waste due to the manufacturing process Prepare *Summary Report of Product Yields, Mass Balances and Operating Conditions* for life cycle assessment
- Prepare *Installation Report* documenting issues and methods for equipment installation and integration, including photographs of installed equipment and operation.
- Prepare detailed *M&V Analytical Report* that verifies energy consumption and engineering calculations for energy and cost savings of the system

Products:

- Recycling Strategy Plan
- Summary Report of Product Yields, Mass Balances and Operating Conditions
- Installation Report
- M&V Analytical Report

TASK 5: DATA COLLECTION AND ANALYSIS

The goal of this task is to measure and verify all data associated with the pyrolysis and bio-oil production process.

The Recipient shall:

- Coordinate all efforts for bio-oil product testing and analysis.
- Provide bio-oil to subcontractor facilities for testing and analysis.
- Establish testing protocols and data collection procedures.
- Test all monitoring equipment.
- Create a *Test Plan* describing test objectives, procedures, conditions, facilities, and equipment being used to for bio-oil production.
- Conduct monthly status reports with researchers.
- Operate pilot plant demonstration of the pyrolysis bio-oil production technology system for a period of 9 months _or a lesser period of time as approved by the CAM.
- Prepare *Data Collection and Analysis Report*, which shall include, but not be limited to the following:
 - Determine the most cost-intensive parts of the developed projects and make projections on how these costs will change based on a transition from pilot-scale project to a commercial scale project (> 500,000 gallons of

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- intermediate fuel per year) and suggest solutions on how to minimize the costs
- Describe how the project will or has achieved a carbon intensity value less than ARB's LCFS reference baseline for renewable diesel (39.33 gCO₂e/MJ)
- Provide analysis on the chemical and physical characterization of bio-oil to ensure that it meets requirements for upgrading in existing refineries (including biorefineries)
- Prepare a *CPR Report* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Test Plan (draft and final)
- Data Collection and Analysis Report
- CPR Report

TASK 6: 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.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.

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- A discussion of research 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 research.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the research 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 information and research have 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 research.
 - A discussion of research 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.

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Products:

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

TASK 7: 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 research. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses research 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 research 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 research 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.
- 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)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

TASK 8: PRODUCTION READINESS PLAN

The goal of this task is to determine the steps that will lead to the manufacturing of

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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.

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: BIOGAS ENERGY INC.

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

RESOLVED, that the Energy Commission approves Agreement FRD-17-001 with Biogas Energy Inc. for a \$5,700,000 grant to install and demonstrate an innovative fast pyrolysis technology to produce bio-oil from wood waste at pilot scale. The Biogas Energy pyrolysis technology aims to establish a new bio-oil industry in California by making small, midsize, and large bio-oil production possible in a distributed or centralized design. Research will also verify the economic scale-up feasibility for the modular system and determine the effectiveness of the production facility to be located near the feedstock source; 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 February 21, 2018.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat

