

New Agreement ARV-15-067 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
600 Fuels and Transportation Division	Akasha Khalsa	27	916-657-4854

Recipient's Legal Name	Federal ID Number
Quantitative BioSciences, Inc.	27-2716733

Title of Project
"Compressed Biomethane Vehicle Fuel and Algae Feed Production via Sustainable Anaerobic Digester Biogas Purification" Project

Term and Amount	Start Date	End Date	Amount
	4 / 30 / 2016	11 / 30 / 2019	\$ 2,000,000.00

Business Meeting Information

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

Proposed Business Meeting Date	4 / 13 / 16	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Akasha Khalsa	Time Needed:	5 minutes

Please select one list serve. Altfuels (AB118- ARFVTP)

Agenda Item Subject and Description

QUANTITATIVE BIOSCIENCES, INC. Proposed resolution approving Agreement ARV-15-067 with Quantitative BioSciences, Inc. for a \$2,000,000 grant to design, construct and operate a pilot Membrane Gas Purification System to produce at least 100,000 diesel gallon equivalents per year of biomethane transportation fuel at Fiscalini dairy farm in Modesto. In addition, Quantitative BioSciences will design, construct and operate a high rate algae pond and use the carbon dioxide from its anaerobic digester to feed the algae, rather than release it into the air. The growing algae biomass will consume wastewater nutrients, and be harvested to produce a dried, nutrient rich animal feed co-product, while the water will be treated sufficiently for agricultural purposes. The dairy cows will eat the algae, to complete a sustainable carbon cycle.

California Environmental Quality Act (CEQA) Compliance

- Is Agreement considered a "Project" under CEQA?

Yes (skip to question 2) No (complete the following (PRC 21065 and 14 CCR 15378)):

Explain why Agreement is not considered a "Project":
 Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because .
- If Agreement is considered a "Project" under CEQA:

a) Agreement **IS** exempt. (Attach draft NOE)

Statutory Exemption. List PRC and/or CCR section number:

Categorical Exemption. List CCR section number:

14 CCR 15301 "Existing Facilities"
 14 CCR 15303 "New Construction or Conversion of Small Structures"
 14 CCR 15304 "Minor Alterations to Land"

Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section:
 The existing facility treats the waste of at least 2,500 cows and the anaerobic digester on site currently produces electricity, biomethane, and carbon dioxide gas. The Membrane Gas Purification System will be located on a small cement pad near the two 85 foot diameter anaerobic digester tanks and will clean the biomethane produced to make it suitable as a vehicle fuel, and will divert the carbon dioxide exhaust produced as a result of the waste treatment process into the algae ponds instead of into the atmosphere. The anaerobic digester will continue to produce electricity as well. Additionally, one shallow algae raceway pond of 1.25 acres with a paddlewheel mixing system, plus up to 7 smaller ponds will be installed downstream of existing dairy waste lagoons, from which nutrient-reduced dairy wastewater will go to existing croplands. Trenching on agricultural land for electrical and plumbing connections among fully lined ponds will extend less than a mile. Algae will be harvested for cattle feed. Some biomethane gas produced on site and previously combusted in the combined heat and power system will be compressed and hauled away periodically.

Therefore, this project is exempt because the project involves minor alterations of the dairy facility involving negligible or no expansion of use beyond that existing; the project involves the construction and location of a

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION



small new pilot Membrane Gas Purification System located on a small cement pad; and the project involves minor alterations and trenching to the existing lagoon land which do not involve the removal of healthy, mature, and scenic trees.

b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)

Check all that apply

Initial Study

Negative Declaration

Mitigated Negative Declaration

Environmental Impact Report

Statement of Overriding Considerations

List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)

Legal Company Name:	Budget
See attached	\$
	\$

List all key partners: (attach additional sheets as necessary)

Legal Company Name:
Organic Solutions Management, LLC
Fiscalini Properties, L.P.

Budget Information

Funding Source	Funding Year of Appropriation	Budget List No.	Amount
ARFVTF	2014-2015		\$2,000,000
Funding Source			\$
R&D Program Area: N/A		TOTAL:	\$2,000,000
Explanation for "Other" selection			
Reimbursement Contract #:	Federal Agreement #:		

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	Natalie Cookson			Name:	Natalie Cookson		
Address:	Quantitative BioSciences, Inc. 11575 Sorrento Valley Rd. #205			Address:	Quantitative BioSciences, Inc. 11575 Sorrento Valley Rd. #205		
City, State, Zip:	San Diego, CA 92121-1320			City, State, Zip:	San Diego, CA 92121-1320		
Phone:	858-208-0280	Fax:	858-848-1724	Phone:	858-208-0280	Fax:	858-848-1724
E-Mail:	natalie.cookson@qbisci.com			E-Mail:	natalie.cookson@qbisci.com		

Selection Process Used

Competitive Solicitation
 First Come First Served Solicitation
 Solicitation #: PON-13-609

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

Subcontractors Quantitative BioSciences, Inc.

“Compressed Biomethane Vehicle Fuel and Algae Feed Production via Sustainable Anaerobic Digester Biogas Purification” Project

<u>Legal Company Name</u>	<u>Budget</u>	
AAA Structural Engineering	\$40,000	(\$0 match)
The Cadmus Group, Inc.	\$20,000	(\$0 match)
Organic Solutions Management, LLC	\$50,000	(\$0 match)

Exhibit A SCOPE OF WORK

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2		Planning and Design
3	X	Construction and Test Plan Preparation
4	X	Operation
5		Commercialization Analysis
6		Data Collection and Analysis

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1-6	Jeff Hasty – QBI Natalie Cookson – QBI	Organic Solutions Management, LLC	Fiscalini Properties, L. P.
3-4	Michael Ferry - QBI	Builder TBD	
4	Bud Marx - QBI		

GLOSSARY

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

Term/ Acronym	Definition
AD	Anaerobic digester
ARFVTP	Alternative and Renewable Fuel and Vehicle and Technology Program
CAM	Commission Agreement Manager
CPR	Critical Project Review
DGE	Diesel Gallons Equivalent of pure methane equals volume in scf * 0.0075853
FTD	Fuels and Transportation Division
SCF	standard cubic feet
QBI	Quantitative BioSciences, Inc.

Background:

Assembly Bill (AB) 118 (Núñez, Chapter 750, Statutes of 2007), created the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). The statute authorizes the California Energy Commission (Energy Commission) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change, clean air, and alternative energy policies. AB 8 (Perea, Chapter 401, Statutes of 2013) re-authorizes the ARFVTP through January 1, 2024. The ARFVTP has an annual budget of approximately \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and non-road vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

The Energy Commission issued solicitation PON-13-609 entitled "Pilot-Scale and Commercial Scale Advanced Biofuels Production Facilities" under the ARFVTP on January 14, 2014. This competitive grant solicitation was an offer to cost share the development and production of new low carbon transportation fuels. In response to PON-13-609, Quantitative BioSciences, Inc. (Recipient) submitted application number 18 which was proposed for funding in the Energy Commission's Notice of Proposed Awards on November 12, 2015. PON-13-609 and Recipient's aforementioned applications are hereby incorporated by reference into this Agreement in their entirety.

In the event of any conflict or inconsistency between the terms of the Solicitation and the terms of the Recipient's Application, the Solicitation shall control. In the event of any conflict or inconsistency between the Recipient's Application and the terms of the Energy Commission's Award, the Energy Commission's Award shall control. Similarly, in the event of any conflict or inconsistency between the terms of this Agreement and the Recipient's Application, the terms of this Agreement shall control.

Problem Statement:

The "Compressed Biomethane Vehicle Fuel and Algae Feed Production via Sustainable Anaerobic Digester Biogas Purification" project addresses a number of problems by constructing pilot upgrades to a dairy farm anaerobic digester (AD) to capture carbon biologically instead of releasing it in exhaust. The project also treats dairy wastewater in high rate algae ponds to provide clean water and a nutrient rich animal feed co-product while selling biomethane vehicle fuel.

The existing Fiscalini Farms anaerobic digester processes manure as well as food waste, and an onsite lagoon handles liquid waste along with the digester effluent. Untreated wastewater is a largely untapped resource, as it contains almost 10 times more energy than is required to treat it. In addition, the breakdown of this waste creates a large amount of greenhouse gases,

contributing to health and environmental problems.

The conversion of AD biogas to transportation fuel has been slow to emerge, as making renewable electricity on site often seems more economical. Market related barriers include the small fraction of all California vehicles that use compressed natural gas, although there is a growing demand. Transporting the cleaned biomethane to a retail transportation fuel outlet is an additional complication. Renewable electricity can be sold as RECs through existing transmission lines, but farms cannot normally insert the biogas into an existing natural gas pipeline without investing in additional expensive infrastructure to meet the utility company's criteria beyond fuel purity. The utility barrier may be the most difficult to solve.

A primary barrier to the adoption of this biogas purification and feed production system is high complexity and capital cost. While the science that demonstrates that algae systems provide an attractive alternative to traditional dairy waste treatment methods, without several scientific improvements as proposed by Quantitative BioSciences, Inc. (QBI) to enhance the utility of the algae biomass as well as to clean the biogas fuel, there is little incentive for businesses.

Goals of the Agreement:

- Produce 100,000 DGE per year (13,200,000 scf/y) of biomethane.
- Sell on-road motor vehicle biomethane fuel.
- Design and construct efficient cleaning of biogas suitable for transportation fuel.
- Design and build algae raceway ponds.
- Research production of animal feed from algae.
- Reduce the full fuel cycle carbon footprint and increase the sustainability of biogas produced from dairy manure by an existing anaerobic digester system at Fiscalini Farms, a large 2500-cow dairy in Modesto, CA.

Objectives of the Agreement:

- Design and build the Membrane Gas Purification System, an anaerobic digester biogas outflow filter system to dissolve carbon dioxide into dairy wastewater for algae growth and to separate, measure and dispense biomethane.
- Evaluate quantity and quality of biogas produced under a Fuel Quality Assurance Plan.
- Sell the clean, compressed biomethane to a transportation fuel outlet.
- Clean dairy wastewater:
 - Design open raceway ponds with paddle wheel mixing systems.
 - Build one 1.25 acre algae raceway pond and a few smaller seed ponds.
 - Design and build an algae harvesting system.
 - Produce 10 metric tons of algae biomass per year.

- Analyze the algae biomass using biological procedures.
- Generate a nutrient-rich animal feed from algae.
- Perform water testing on the final effluent.
- Use cleaned water to irrigate farm land.
- Reduce GHG emissions by 1000 metric tons per year due to vehicle use of the resulting compressed biomethane instead of diesel.
- Report on both the technical feasibility and projected economic performance of the built project and possible future larger systems.

TASK 1 ADMINISTRATION

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement. The CAM shall designate the date and location of this meeting and provide an agenda to the Recipient prior to the meeting.

The Recipient shall:

- Attend a “Kick-Off” meeting with the Commission Agreement Manager, the Grants Officer, and representative of the Energy Commission. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Commission Agreement Manager to this meeting.
- Discuss the following administrative and technical aspects of this Agreement:
 - Agreement Terms and Conditions
 - Critical Project Review (Task 1.2)
 - Match fund documentation (Task 1.6) No reimbursable work may be done until this documentation is in place.
 - Permit documentation (Task 1.7)
 - Subcontracts needed to carry out project (Task 1.8)
 - The CAM's expectations for accomplishing tasks described in the Scope of Work
 - An updated Schedule of Products and Due Dates
 - Monthly Progress Reports (Task 1.4)
 - Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
 - Final Report (Task 1.5)

Recipient Products:

- Updated Schedule of Products

- Updated List of Match Funds
- Updated List of Permits

Commission Agreement Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule or budget.

The Commission Agreement Manager may schedule CPR meetings as necessary, and meeting costs will be borne by the Recipient.

Meeting participants include the CAM and the Recipient and may include the Commission Grants Officer, the Fuels and Transportation Division (FTD) biofuel lead, other Energy Commission staff and Management as well as other individuals selected by the CAM to provide support to the Energy Commission.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. Prepare a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see section 8 of the Terms and Conditions). If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Lead Commissioner for Transportation for his or her concurrence.
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this scope of work. The Recipient shall submit these documents to the CAM and any other designated reviewers at least 15 working days in advance of each CPR meeting.

- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

CAM Products:

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

Recipient Product:

- CPR Report(s)

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Commission Grants Office Officer, and the Commission Agreement Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Agreement Manager.

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Commission Agreement Manager will determine the appropriate meeting participants.

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

- What to do with any equipment purchased with Energy Commission funds (Options)
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Products:

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

Task 1.4 Monthly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.

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

The Recipient shall:

- Prepare a Monthly Progress Report which summarizes all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Agreement Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in Section 6 of the Terms and Conditions of this Agreement.
- In the first Monthly Progress Report and first invoice, document and verify match expenditures and provide a synopsis of project progress, if match funds have been expended or if work funded with match share has occurred after the notice of proposed award but before execution of the grant agreement. If no match funds have been expended or if no work funded with match share has occurred before execution, then state this in the report. All pre-execution match expenditures must conform to the requirements in the Terms and Conditions of this Agreement.

Product:

- Monthly Progress Reports

Task 1.5 Final Report

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

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

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

The Recipient shall:

- Prepare an Outline of the Final Report, if requested by the CAM.

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

Products:

- Outline of the Final Report, if requested
- Draft Final Report
- Final Report

Task 1.6 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the Energy Commission budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of Energy Commission funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter a list of the match funds that identifies the:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured. For match funds provided by a grant a copy of the executed grant shall be submitted in place of a letter of commitment.

- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Agreement Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Agreement Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR meeting.

Products:

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

Task 1.7 Identify and Obtain Required Permits

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

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

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions or lead agencies
 - The schedule the Recipient will follow in applying for and obtaining these permits.

- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule and the copies of the permits. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the Progress Reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, provide the appropriate information on each permit and an updated schedule to the Commission Agreement Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Agreement Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Agreement Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

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

Task 1.8 Obtain and Execute Subcontracts

The goal of this task is to ensure quality products and to procure subcontractors required to carry out the tasks under this Agreement consistent with the Agreement Terms and Conditions and the Recipient's own procurement policies and procedures. It will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, and that the budgeted expenditures are reasonable and consistent with applicable cost principles.

The Recipient shall:

- Manage and coordinate subcontractor activities.
- Submit a draft of each subcontract required to conduct the work under this Agreement to the Commission Agreement Manager for review.
- Submit a final copy of the executed subcontract.
- If Recipient decides to add new subcontractors, then the Recipient shall notify the CAM.

Products:

- Draft subcontracts
- Final subcontracts

TECHNICAL TASKS

TASK 2 PLANNING AND DESIGN

The goals of this task are to develop a set of pre-engineering documents common to the construction of any QBI Biorefinery System separate from the specific parameters of each client dairy, to precisely calculate the required dimensions and locations of each system component, and to quantify the baselines of biomass processing before construction.

The Recipient shall:

- Determine construction details for the production facility.
- Write a Fuel Quality Assurance Plan to evaluate the quantity and quality of biogas produced before and after the QBI Biorefinery System is built.
- Prepare an Existing Fiscalini Farms Anaerobic Digester Initial Conditions Report to establish the baselines, including (when possible) but not limited to:
 - A flow-chart of the biomass conversion processes.
 - A description of volume, conditions, and disposition of the dairy's full waste load, both solid and liquid, prior to project operation.
 - A quantitative description of anaerobic digester feedstock prior to project operation.
 - A description of the most recent 12 months of daily biogas production on site, divided by digester, prior to project operation. A quantification of anaerobic digester electricity generation prior to project operation.
 - A quantification of heat usage from electricity generation prior to project operation.
 - The local air emissions reporting requirements for flared gas.
 - A list of types and quantity of cattle feed the farm grows on their land.
- Prepare and submit QBI Biorefinery Overview Report including, but not limited to:
 - A description of the project technology in general, explaining how it works and how it advances state-of-the-art biofuels production technology.
 - Describe the gas purification system
 - Specify pond and construction materials
 - Specify the paddle wheel materials, dimensions, and horsepower
 - Describe other liquid flow techniques (pumps, gravity, etc.)
 - Describe the algae harvesting system
 - Describe the required controls and sensors
 - List the inputs
 - List the outputs including fuels, power, heat, and value-added co-products from biomass
 - Describe techniques for preventing migrating waterfowl infestation
 - Describe the biogas off-take plan
- List and submit the major equipment with brand and model, air emissions, and

- capacity.
- Prepare and submit the QBI Biorefinery Site Plan, including but not limited to:
 - Precise locations of each pond to scale on a map of the dairy.
 - Volume and dimensions of each pond.
 - The required distance between ponds to enable accessibility.
 - Pond connections to each other.
 - The location of the control system panel.
 - The flow pattern of water.
 - Prepare and submit a Written Verification of Design Work letter including but not limited to:
 - The design work completion date.
 - A flow-chart of the biomass conversion processes for the QBI Biorefinery Project.
 - A quantification of the waste load to be treated during the demonstration period.
 - A quantification of the planned monthly volumes of biogas through the Membrane Gas Purification System during the project demonstration period.
 - A quantification of the expected sellable volume of transportation fuel biomethane.
 - A quantification of the expected volume of animal feed.
 - Develop and submit a Construction Timeline running from the intended date to begin construction, including commissioning, until the commercial operation date of the project, which is defined as the date of first sale and off-take of compressed biogas at more than 25% of its design capacity.

Products:

- Existing Fiscalini Farms Anaerobic Digester Initial Conditions Report
- Fuel Quality Assurance Plan
- QBI Biorefinery Overview Report
- Major Equipment List
- QBI Biorefinery Site Plan
- Written Verification of Design Work
- Construction Timeline

TASK 3 CONSTRUCTION AND TEST PLAN PREPARATION

The goals of this task are to construct a biorefinery and to derive a precise plan for testing the operation of this algae-pond based system for the enhanced treatment of the dairy waste at Fiscalini Farms.

The Recipient shall:

- Prepare and submit a Written Notification of Readiness to Construct stating the project has obtained all permits, third party agreements, binding construction and equipment bids, and all other items necessary to begin construction.
- Construct the biogas facility according to the finalized design and as outlined in the Construction Timeline and Equipment list. This construction shall include the following major components:
 - Membrane Gas Purification System
 - Biomethane Dispensing System
 - Algae Growth Pond System
 - Algae harvesting system
- Prepare and submit the QBI Biorefinery Test Plan including but not limited to:
 - A description of each test required to analyze the water, gas, and biomass quality.
 - An explanation of the technical approach to each test – how each test is performed and what it measures.
 - Schedules describing out how often each test is required.
- Prepare and submit a Written Notification of Commercial Operation and submit it to the Commission Agreement Manager within ten working days of commercial operation of the project. The Written Notification shall contain the following elements:
 - The date the project achieved commercial operation.
 - A narrative on the current status of the project and initial operations.
 - Documentation of construction with a series of photographs.
 - Current transportation fuel biomethane local market price - wholesale and retail.

[CPR WILL BE HELD DURING THIS TASK. See Task 1.2 for details]

Products:

- QBI Biorefinery Test Plan
- Written Notification of Readiness to Construct
- Written Notification of Commercial Operation

TASK 4 OPERATION

The goals of this task are to operate the QBI Biorefinery commercially, sell biomethane, analyze the water treatment, and investigate algae as cattle feed.

The Recipient shall:

- Operate the QBI Biorefinery.
 - Ensure water quality according to QBI Biorefinery Test Plan.
 - Ensure biogas quality according to QBI Biorefinery Test Plan.
- Sell biomethane.
- Prepare and submit QBI Biorefinery Production Report about any single month during the demo period including, but not limited to:
 - Quantity of biofuel production.
 - Quantity of biomass production.
 - Documentation of test results.
- Prepare and submit a QBI Biorefinery Water Treatment Overview Report including, but not limited to:
 - Water quality before and after treatment.
 - Membrane Gas Purification System performance.
 - Carbonation of pond water.
 - Water loss rate (e.g. evaporation and leakage).
 - Biomass harvesting results.
- Prepare and submit an Algae Feed Report including, but not limited to:
 - Nutritional analysis of algae biomass.
 - Results of feed tests on the farm's heifers, using algae biomass to supplement a portion of their normal feed.
 - An analysis of specifications for algae cattle feed storage such as dryness, packaging, and shelf life.
 - An analysis of the competition.

[CPR WILL BE HELD DURING THIS TASK. See Task 1.2 for details]

Products:

- QBI Biorefinery Production Report
- QBI Biorefinery Water Treatment Overview Report
- Algae Feed Report

Task 5 COMMERCIALIZATION ANALYSIS

The goal of this task is provide carbon intensity of the biogas, to examine ways to commercialize the system by the end of the grant term, to prepare a Techno-Economic Study and submit the Techno-Economic Study “Executive Summary”.

The Recipient shall:

- Provide carbon intensity of the biogas in grams of CO₂-equivalent per megajoule (gCO₂e/MJ) in a letter.
 - Calculate carbon intensity using a method that conforms to the ARB’s LCFS.
 - Provide assumptions and calculations to substantiate claimed carbon intensities. (The ARB calculation methodology guidance is available at: <http://www.arb.ca.gov/fuels/lcfs/2a2b/internal/mixed-feedstock-bdrd-120112.pdf>.)
 - If the carbon intensity pathway of the proposed project has already been calculated through the ARB’s Low Carbon Fuel Standard (LCFS) process, provide the carbon intensity of the project’s fuel and the pathway identifier(s) from the Low Carbon Fuel Standard Reporting Tool and Credit Bank & Transfer System (LRT-CBTS) (<https://ssl.arb.ca.gov/lcfsrt/Login.aspx>), in lieu of the above.
- Prepare a Techno-Economic Study to prepare for deployment to marketplace including, but not limited to:
 - Demonstrate the long-term commercial economic viability of the QBI Biorefinery.
 - Determine the benefits achieved by the project.
 - Demonstrate the transferability of the technology.
 - Develop guidelines for the construction of a generic set-up.
 - Determine the capital expense of this project to the farm.
 - Estimate investment required by future clients.
 - Estimate simple payback.
 - Estimate labor to operate and maintain the system.
 - Discuss estimated value and planned use of any potential LCFS, Renewable Fuel Standard Program (RFS2), and/or cap and trade credits.
 - Estimate 5 year pro forma statements.
 - Estimate biogas revenue and break-even pricing.
 - Estimate co-product revenue and break-even pricing.
 - Estimate financial cash flow.
 - Market for products
 - Value of “organic certification.”
 - Describe regulations affecting sites.

- Prepare and submit an “Executive Summary” of the Techno-Economic Study

Products:

- Provide carbon intensity
- Techno-Economic Study “Executive Summary”

Task 6 DATA COLLECTION AND ANALYSIS

The goal of this task is to collect operational data from the project, to analyze that data for economic and environmental impacts, and to include the data and analysis in the Final Report.

The Recipient shall:

- Develop data collection test plan.
- Troubleshoot any issues identified.
- Collect 6 months of throughput, usage, and operations data from the project including, but not limited to:
 - Maximum capacity of the new fueling system
 - Gallons of gasoline and/or diesel fuel displaced (with associated mileage information)
 - Expected air emissions reduction, for example:
 - Non-methane hydrocarbons
 - Oxides of nitrogen
 - Non-methane hydrocarbons plus oxides of nitrogen
 - Particulate Matter
 - Formaldehyde
 - Duty cycle of the current fleet and the expected duty cycle of future vehicle acquisitions
 - Specific jobs and economic development resulting from this project
- Identify any current and planned use of renewable energy at the facility.
- Identify the source of the alternative fuel.
- Describe any energy efficiency measures used in the facility that may exceed Title 24 standards in Part 6 of the California Code Regulations.
- Provide data on potential job creation, economic development, and increased state revenue as a result of expected future expansion.
- Provide a quantified estimate of the project’s carbon intensity values for life-cycle greenhouse gas emissions.
- Compare any project performance and expectations provided in the proposal to Energy Commission with actual project performance and accomplishments.
- Collect data, information, and analysis described above and include in the Final Report.

Products:

- Include data collected and analysis in the Final Report

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: QUANTITATIVE BIOSCIENCES, 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 ARV-15-067 from PON-13-609 with Quantitative BioSciences, Inc. for a \$2,000,000 grant to design, construct and operate a pilot Membrane Gas Purification System to produce at least 100,000 diesel gallon equivalents per year of biomethane transportation fuel at Fiscalini dairy farm in Modesto. In addition, Quantitative BioSciences will design, construct and operate a high rate algae pond and use the carbon dioxide from its anaerobic digester to feed the algae, rather than release it into the air; and

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

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on April 13, 2016.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat