

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-14-041 (To be completed by CGL Office)

Division		Agreement Manager:		MS-	Phone
ERDD		Mike Kane		43	916-327-1530
Recipient's Legal Name				Federal ID Number	
Biogas & Electric, LLC				26-4401598	
Title of Project					
Installation of a Lean Burn Biogas Engine with Emissions Control to Comply at a Wastewater Treatment Plant					
Term and Amount	Start Date	End Date	Amount		
	6/1/2015	5/31/2018	\$ 2,249,322		
Business Meeting Information					
<input type="checkbox"/> ARFVTP agreements under \$75K delegated to Executive Director.					
Proposed Business Meeting Date		4/8/2015	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion	
Business Meeting Presenter		Mike Kane	Time Needed: 5 minutes		
Please select one list serve. Select					
Agenda Item Subject and Description					
BIOGAS & ELECTRIC, LLC. Proposed resolution approving Agreement EPC-14-041 with Biogas & Electric, LLC for a \$2,249,322.00 grant to demonstrate a low-cost wet scrubber technology with a biogas fired lean burn engine at a waste water treatment plant. (EPIC funding) Contact: Mike Kane. (5 minutes)					
California Environmental Quality Act (CEQA) Compliance					
1. Is Agreement considered a "Project" under CEQA?					
<input checked="" type="checkbox"/> Yes (skip to question 2) <input type="checkbox"/> No (complete the following (PRC 21065 and 14 CCR 15378)):					
Explain why Agreement is not considered a "Project":					
Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because					
2. If Agreement is considered a "Project" under CEQA:					
<input checked="" type="checkbox"/> a) Agreement IS exempt. (Attach draft NOE)					
<input type="checkbox"/> Statutory Exemption. List PRC and/or CCR section number: _____					
<input checked="" type="checkbox"/> Categorical Exemption. List CCR section number: 14 CCR 15329					
<input type="checkbox"/> Common Sense Exemption. 14 CCR 15061 (b) (3)					
Explain reason why Agreement is exempt under the above section:					
Class 29 - Installation of certain cogeneration equipment of less than 50 megawatts capacity at existing facilities.					
<input type="checkbox"/> b) Agreement IS NOT exempt. (Consult with the legal office to determine next steps.)					
Check all that apply					
<input type="checkbox"/> Initial Study		<input type="checkbox"/> Environmental Impact Report			
<input type="checkbox"/> Negative Declaration		<input type="checkbox"/> Statement of Overriding Considerations			
<input type="checkbox"/> Mitigated Negative Declaration					
List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)					
Legal Company Name:			Budget		
BSK Associates, Engineers and Laboratories			\$ 4,200		
List all key partners: (attach additional sheets as necessary)					
Legal Company Name:					
Budget Information					
Funding Source		Funding Year of Appropriation	Budget List No.	Amount	
EPIC		13-14	301.001A	\$2,249,322	
R&D Program Area:	EGRO: Renewables		TOTAL:	\$2,249,322	
Explanation for "Other" selection					
Reimbursement Contract #:			Federal Agreement #:		
Recipient's Administrator/ Officer			Recipient's Project Manager		
Name:		Seth Burns		Name:	
Address:		4225 EXECUTIVE SQ STE 430		Address:	
City, State, Zip:		LA JOLLA, CA 92037-1499		City, State, Zip:	
Phone:		619)251-3849 / Fax: - -		Phone:	
E-Mail:		seth@biogasandelectric.com		E-Mail:	

GRANT REQUEST FORM (GRF)



Selection Process Used

<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: PON-14-305
<input type="checkbox"/> First Come First Served Solicitation	

The following items should be attached to this GRF

1. Exhibit A, Scope of Work	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<input checked="" type="checkbox"/> Attached
3. CEC 105, Questionnaire for Identifying Conflicts	<input checked="" type="checkbox"/> Attached
4. Recipient Resolution	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached
5. CEQA Documentation	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached

 Agreement Manager Date Office Manager Date Deputy Director Date

Exhibit A Scope of Work

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		AD Effluent, Emissions and Site Analysis
3		NOxRx [®] Test Plan Preparation
4	X	NOxRx [®] Design (Phase 1, 2)
5		Project Construction and Site Preparation
6	X	NOxRx [®] Fabrication and Installation (Phase 1, 2)
7		Project Operation: Data Collection and Analysis
8		Evaluation of Project Benefits
9		Production Readiness Plan
10		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AD	Anaerobic Digestion
BACT	Best Available Control Technology
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CARB	California Air Resources Board
CHP	Combined Heat and Power biogas fired lean burn engine
CO	Carbon Monoxide
CPR	Critical Project Review
CPUC	California Public Utilities Commission
lbs	Pounds
LCOE	Levelized Cost of Electricity
MW	Megawatt
MWh	Megawatt Hour
NOx	Oxides of Nitrogen (mainly NO and NO ₂)
NOxRx [®]	Emissions control technology developed by Biogas & Electric
ORP	Oxidation Reduction Potential
ppm	Parts Per Million
ppmv	Parts Per Million by Volume
SCAQMD	South Coast Air Quality Management District
SOx	Oxides of Sulfur (mainly SO ₂)
SCR	Selective Catalytic Reduction
TAC	Technical Advisory Committee
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

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

Exhibit A Scope of Work

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a project designed to leverage and build upon the previously obtained pilot results in order to establish NOxRx[®] as the best available control technology (BACT) for all biogas engines operating at municipal Wastewater Treatment Plant (WWTPs) within South Coast Air Quality Management District (SCAQMD) where Rule 1110.2² is limiting biogas project development through Oxides of Nitrogen (NOx), Carbon Monoxide (CO) and Volatile Organic Compound (VOC) emissions regulation.

B. Problem/ Solution Statement

Problem

California has a large number of municipal wastewater treatment plants (WWTPs) that serve a critical need in California's communities. Anaerobic digestion (AD) is an important step in the municipal wastewater treatment process, reducing solids while also creating a renewable source of methane rich biogas. Biogas can be combusted in an efficient, low cost Combined Heat and Power (CHP) internal combustion engine to produce both electrical and thermal energy. Municipal WWTPs in California have great potential to deliver low cost renewable energy to the communities they serve, increasing the community's energy security while simultaneously providing significant environmental benefits. Black & Veatch³ has estimated that municipal WWTPs in California could produce an additional 241 megawatts (MW) of renewable electricity from biogas.

Combustion of biogas in mass produced low cost CHP-enabled internal combustion engines is more economical than fuel cells, micro-turbines or conditioning biogas to pipeline quality. However, biogas fired internal combustion engines generate high NOx emissions making it difficult for projects to obtain air permits for biogas fired CHP. The best available control technology (BACT) for biogas fired engines is urea injected selective catalytic reduction (SCR), which requires expensive biogas conditioning (removal of H₂S and siloxanes) prior to combustion due to poisoning of the catalytic process. SCR systems are theoretically capable of reducing NOx emissions in biogas fired CHP exhaust streams to approximately 9-11 ppm, but are simply not capable of complying the California Air Resources Board (CARB) standard of 0.07 lbs. of NOx per megawatt hour (MWh), or 2-3 ppm. The inability of CHPs to comply with existing air regulations is forcing many facilities to not utilize their valuable biogas stream.

Solution

The Recipient is developing a low cost NOx, SOx reduction technology called NOxRx[®] which can be used in conjunction with all biogas engines and anaerobic digesters in the market today. NOxRx[®] has a unique, patented method of utilizing the effluent from an anaerobic digester in the emissions control process. Furthermore, unlike SCR, NOxRx[®] does not produce N₂O and does not require H₂S removal or biogas conditioning prior to combustion. Therefore, NOxRx[®] represents a significant cost savings over competing NOx reduction solutions. NOxRx[®] is also

² Rule 1110.2 establishes emissions limits for gaseous- and liquid-fueled engines to reduce Oxides of Nitrogen (NOx), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) from all stationary and portable engines over 50 rated brake horsepower. See <http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1110-2.pdf?sfvrsn=4> for details.

³ See Table 3.1 in http://www.cpuc.ca.gov/NR/rdonlyres/9ABE17A5-3633-4562-A6DA-A090EB3F6D07/0/SmallScaleBioenergy_DRAFT_04092013.pdf

Exhibit A

Scope of Work

more effective at reducing NOx emissions than other solutions. Results from the Recipient's prototype in Imperial County have demonstrated NOxRx's ability to reduce NOx from 90 ppm (at 15% O₂) down to 2 ppm (at 15% O₂) and SOx from more than 1000 ppm to less than 1 ppm.

C. Goals and Objectives of the Agreement

Agreement Goals

- 1.) To design, construct and install a continuously operating commercial scale emissions reduction system for the lean burn biogas engine(s) at a WWTP-based biogas project.
- 2.) To demonstrate the commercial viability of NOxRx[®] to the biogas industry, and enable biogas fired lean burn reciprocating engines to achieve a new BACT standard and to comply with SCAQMD's Rule 1110.2 and existing CARB NOx and SOx regulations.

Ratepayer Benefits:⁴ This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by decreasing the reliance on petroleum-based fuels, increasing both the use of renewable waste-to-energy fuels, and distributed generation.

Meeting the above stated goals and objectives will both directly and indirectly benefit California energy rate payers. The amount of electrical and thermal power that can be realized through biogas project development within the state of California is significant. Development of waste-to-energy resources through biogas project development with NOxRx[®] as the emissions control solution will increase fuel use efficiency by allowing for use of CHP rather than other less efficient biogas utilization technologies, decrease demand for use of petroleum-based fuels by using biogas for local electrical generation, reduce hazardous and health-damaging emissions such as NOx and SOx, provide regions of California with a low cost, secure and reliable electricity supply through distributed generation, and help reduce peak demand for electricity by enabling dairies and WWTPs to operate largely off the grid.

Technological Advancement and Breakthroughs:⁵ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by significantly lowering a biogas project's cost for complying with existing air quality regulations. Commercial deployment of a technology that will reduce biogas-fired engine NOx emissions from 90 ppm (at 15% O₂) down to 2 ppm (at 15% O₂), and SOx from more than 1000 ppm to less than 1 ppm will enable more WWTPs to use biogas for on-site combined heat and power systems, reducing their need for grid electricity and simultaneously helping them attain compliance with strict air quality regulations.

⁴ California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

⁵ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

Exhibit A Scope of Work

Agreement Objectives

The objectives of this Agreement are to:

- 1) To reduce NOx emission from the untreated level to exceed the current BACT standard of 9-11 ppm and also to a level that meets or exceeds the existing CARB standard of 0.07 lbs. of NOx per MWh (or 2-3 ppm). The economics of reducing NOx to the BACT standard and the CARB standard will be calculated and reported as costs per pound of NOx reduced.
- 2) To reduce SOx emissions to less than 1 ppm.
- 3) To reduce NOx and SOx emissions from a lean burn biogas engine at a cost lower than that of the current leader as outlined by BACT NOx cost effectiveness threshold of \$19,100/ton of NOx reduced.
- 4) To reduce CO emissions to 250 parts per million by volume (ppmv) to comply with SCAQMD's Rule 1110.2.
- 5) To reduce VOC emissions to 30 ppmv to comply with SCAQMD's Rule 1110.2.

II. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

For products that require a draft version

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

For products that require a final version only

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

For all products

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

Exhibit A

Scope of Work

- **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- 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.

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MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

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

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

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

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

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Exhibit A

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Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

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

Recipient Products:

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

CAM Products:

- CPR Agenda

Exhibit A Scope of Work

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

Subtask 1.4 Final Meeting

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

The Recipient shall:

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

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

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

Products:

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

Exhibit A Scope of Work

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - Summarize all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
 - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of Funds” section of the terms and conditions. In addition, each invoice must document and verify:
 - Energy Commission funds received by California-based entities;
 - Energy Commission funds spent in California (*if applicable*); and
 - Match fund expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual

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Subtask 1.6.2 Final Report

The Recipient shall:

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

Products:

- Final Report (draft and final)

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:

- A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
 - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
- 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.

Exhibit A Scope of Work

- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

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

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

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

Products:

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

Exhibit A Scope of Work

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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

- Researchers knowledgeable about the project subject matter;
- 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;

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- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare and submit 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 and submit 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 and submit 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 and submit 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 and submit *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

Products:

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

Exhibit A Scope of Work

III. 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: AD Effluent, Emissions and Site Analysis

The goal of this task is to gather site-specific information to allow for efficient and accurate design of an emissions reduction solution specific to the site. The current site for deployment is a waste water treatment plant owned by the City of Palm Springs and managed by Veolia North America. If that plant should become unavailable during the term of the agreement, an alternate site managed by Veolia will be made available to the project, subject to CAM approval.

The Recipient shall:

- Meet with personnel from Veolia North America, manager of the waste water treatment plant (WWTP), and the site owner to conduct site survey and to finalize and submit a **Site Analysis Report** containing but not limited to the following:
 - Project installation location;
 - Project footprint size;
 - A discussion of electrical and plumbing requirements; and
 - A plan for obtaining an air permit.
- Obtain factory specifications for lean burn biogas engines suitable for the site.
- Obtain pertinent chemical analysis on site lagoon water and biogas.
- Prepare and submit a **Site Analytical Report** detailing both the AD effluent (lagoon water) and emissions analyses, including but not limited to the following:
 - AD effluent: pH, Conductivity, oxidation reduction potential (ORP), total nitrogen, ammonia, nitrate, sulfides (bi)carbonate, alkalinity; and
 - Emissions: expected raw exhaust volume, temperature and composition (NO_x, SO_x, CO, VOCs).

Products:

- Site Analysis Report
- Site Analytical Report

TASK 3: NO_xRx[®] Test Plan Preparation

The goal of this task is to prepare a plan to test and verify the ability of NO_xRx[®] to reduce NO_x, CO, VOC and SO_x emissions from a biogas fired CHP operating at a municipal WWTP.

The Recipient shall:

- Develop procedures and testing plans to:
 - Determine which parameters should be measured at the project including, gas and liquid compositions, flow rates, temperatures, and volumes.
 - Ensure measuring capabilities are implemented into the project through either purchasing analytical equipment or contracting with a 3rd party consulting firm.
 - Measure various aspects of the project operation performance that will yield meaningful information.

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- Prepare and submit a **NOxRx[®] Test Plan Report** that includes but is not limited to the following:
 - The preliminary design work used to develop testing plans and procedures for integrating NOxRx[®] with a lean burn biogas fired internal combustion engine configured for combined heat and power.
 - Biogas clean-up and oxidation catalyst options (with corresponding pros and cons);
 - Description of the emissions testing apparatus and procedures;
 - A schedule for obtaining both engine emissions and AD effluent analytical results (chemical composition analysis);
 - A list of chemical substances to be monitored through analysis of emissions and AD effluent both before and after NOxRx[®] treatment; and
 - An outline for obtaining 3rd party and/or air board validation of performance.

Products:

- NOxRx[®] Test Plan Report (draft and final)

TASK 4: NOxRx[®] Design (Phase 1, 2)

The goal of this task is to utilize all the information from Task 2 as well as from prior laboratory and field demonstrations to size and adapt the NOxRx[®] for the biogas engine that will be operating at the proposed WWTP project site in order to meet or exceed SCAQMD's Rule 1110.2 and the existing CARB NOx standard. To achieve optimal performance, final system will employ two NOxRx[®] absorbers that will be iteratively sized and implemented in two phases, henceforth referred to as phases 1 and 2.

The Recipient shall:

- Design the piping and pumping systems that will deliver digester wastewater to and from the project site.
- Design the electrical work that will deliver heat and power to and from the project site.
- Design the piping and pumping systems that will deliver biogas to the project site.
- Design the project layout including, biogas lean burn engine placement, gas conditioning equipment, emissions reduction equipment.
 - The absorption step of the emissions will be built and designed in two phases. The first stage (phase 1) will be approximately 50% of the absorption capacity. After collecting NOx absorption data from the phase 1 installation, the second stage (phase 2) will be designed and implemented.
- Prepare and submit an **Optimized Design Report** containing but not limited to the following:
 - Plans and drawings for the phase 1 iteration of the wet scrubbing system;
 - Optimized plans and drawings for the complete multi-stage wet scrubbing system (phases 2);
 - The optimal equipment sizing, flow rates, oxidant use, material selection and controls for both phases 1 and 2;
 - Biogas clean-up and oxidation catalyst selections.
- Prepare and submit **1st CPR Report**

Products:

- Optimized Design Report (draft and final)
- 1st CPR Report

Exhibit A Scope of Work

TASK 5: Project Construction and Site Preparation

The goal of this task is to prepare the site at the WWTP for installation of equipment for the proposed demonstration project.

The Recipient shall:

- Oversee all site preparations, including:
 - Trenching and installation of piping and electrical conduits that will supply wastewater and electricity to the project site.
 - Construction of a concrete pad.
 - Construction of piping that will supply biogas to the project site.
 - Installation of electrical lines that will supply electricity to and from the project site.
 - Installation of piping that will bring thermal energy from the project site to the digesters
- Oversee all other construction, commercial equipment installation and assembly on site.
- Prepare and submit **Site Preparation Report** containing but not limited to the following:
 - Photographs and a description of project site before, throughout and after construction.

Products:

- Site Preparation Report

TASK 6: NOxRx[®] Fabrication and Installation (Phase 1, 2)

The goal of this task is to fabricate, assemble, install and test NOxRx[®] and associated control system before disassembly, transportation to the site, reassembly and initiation of operation.

The Recipient shall:

- Solicit and accept equipment manufacturer(s) quotation for phases 1 and 2, respectively.
- Finalize and accept signed work-for-hire agreements with electrical, mechanical and plumbing subcontractors.
- Oversee the equipment manufacturer(s) fabrication and test run(s) of NOxRx[®] for phases 1 and 2, respectively.
- Oversee the transportation to, and installation of NOxRx[®] at WWTP site for phases 1 and 2, respectively.
- Prepare and submit **NOxRx[®] Installation Report** containing but not limited to the following:
 - Signed manufacturer(s) quotation(s);
 - Signed and finalized work-for-hire agreement(s); and
 - Photographs and a description of the manufacture/fabrication, testing and transportation process.
- Prepare and submit **2nd CPR Report**

Exhibit A Scope of Work

Products:

- NOxRx® Installation Report
- 2nd CPR Report

TASK 7: Project Operation: Data Collection and Analysis

The goal of this task is to monitor and record all aspects of the overall system operation through the term of this Agreement, and to analyze that data for economic and environmental impacts, and to include the data and analysis in the Final Report.

The Recipient shall:

- Initiate data collection in accordance with the Test Plan Report from Task 3.
- Troubleshoot and resolve any issues identified.
- Based on performance of the phase 1 system, design, fabricate, and install phase 2.
- Collect at least 6 months of throughput, usage, and operations data from the project including, but not limited to:
 - NOx, CO and SOx air emissions using TESTO 350XL gas analyzer or equivalent;
 - VOC emissions using a third party California based consultant.
 - AD effluent: pH, Conductivity, ORP, total nitrogen, ammonia, nitrate, sulfides (bi) carbonate, alkalinity.
- Monitor and keep track of any and all maintenance requirements.
- Gather information necessary to complete TASK 8 including but not limited to the following:
 - Identify any current and planned use of renewable energy at the facility;
 - Identify the source of the alternative fuel;
 - Identify 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; and
 - Compare proposed project performance expectations with actual project performance and accomplishments.
- Obtain and submit 3rd party and/or air board **Validation of System Performance**.

Products:

- Validation of System Performance
- Data collection, information, analyses, and results will be included in the Final Report

Exhibit A Scope of Work

TASK 8 Evaluation of Project Benefits

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

The Recipient shall:

- Complete and submit 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.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
 - Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.
 - For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.

Exhibit A Scope of Work

- The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

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

Products:

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

TASK 9 Production Readiness Plan

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

The Recipient shall:

- Prepare and submit 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)

Exhibit A

Scope of Work

TASK 10 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 and submit an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare and submit a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare and submit a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
 - A description of the intended use(s) for and users of the project results.
 - Published documents, including date, title, and periodical name.
 - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
 - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
 - The number of website downloads or public requests for project results.
 - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare and submit a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

Exhibit A Scope of Work

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: BIOGAS & ELECTRIC, LLC

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

RESOLVED, that the Energy Commission approves Agreement EPC-14-041 from PON-14-305 with **Biogas & Electric, LLC** for a **\$2,249,322** grant to demonstrate a low-cost wet scrubber technology with a biogas fired lean burn engine at a waste water treatment plant; and

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

CERTIFICATION

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

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Harriet Kallemeyn,
Secretariat