New Agreement PIR-17-011 (To be completed by CGL Office)

ERDD	Katharina Snyder	43	916-327-2201

The Regents of the University of California, on behalf of the Irvine Campus	95-2226406

Developing a Methodology to Determine Chemical and Isotopic Composition of Natural Gas Consumed in California

	5/30/2018	3/31/2022	$ 550,000

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

Proposed Business Meeting Date	4/11/2018	☐ Consent	☒ Discussion
Business Meeting Presenter	Katharina Snyder	Time Needed:	10 minutes

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

Agenda Item Subject and Description

UNIVERSITY OF CALIFORNIA, IRVINE. Proposed resolution approving Agreement PIR-17-011 with The Regents of the University of California, on behalf of the Irvine campus for a $550,000 grant to analyze natural gas samples collected at major natural gas basins in the U.S. for their chemical and isotopic composition, and to develop a methodology enabling identification of the basin of origin. Results from this research will support life-cycle accounting of methane emissions from the natural gas supply chain.

1. Is Agreement considered a “Project” under CEQA?
   ☒ Yes (skip to question 2) ☐ No (complete the following (PRC 21065 and 14 CCR 15378)):
   Explain why Agreement is not considered a “Project”:

2. If Agreement is considered a “Project” under CEQA:
   ☒ a) Agreement **IS** exempt. (Attach draft NOE)
   - ☐ Statutory Exemption. List PRC and/or CCR section number:
   - ☒ Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15306
   - ☒ Common Sense Exemption. 14 CCR 15061 (b) (3)

   Explain reason why Agreement is exempt under the above section:
   This project is a paper study that will involve trips to natural gas basis in a number of states in order to collect natural gas samples. Those samples will then be analyzed in an existing laboratory in order to determine their composition and develop a method by which natural gas samples can be traced to their basin of origin. This project is therefore exempt under CEQA Guidelines Section 15061(b)(3) as an activity covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment and exempt under CEQA Guidelines Section 15306 as a basic data collection, research and resource evaluation activity that will not result in a serious disturbance to an environmental resource.

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

Legal Company Name:	Budget
University of Cincinnati	$ 190,000
	$

Legal Company Name:

STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015) CALIFORNIA ENERGY COMMISSION

Budget Information			
Funding Source	**Funding Year of Appropriation**	**Budget List No.**	**Amount**
NG Subaccount, PIERDD	17-18	501.001L	$550,000
			$
R&D Program Area: EGRO: EA			$550,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Name:	Erika Blossom			Name:	Donald Blake		
Address:	141 Innovation, Suite 250			Address:	Department of Chemistry		
City, State, Zip:	Irvine, CA 92697-7600			City, State, Zip:	Irvine, CA 92697-2025		
Phone:	949-824-2237 /	Fax:	949-825-2094	Phone:	949-824-4195 /	Fax:	- -
E-Mail:	erika.blossom@uci.edu			E-Mail:	drblake@uci.edu		

☒ Competitive Solicitation Solicitation #: GFO-17-502

☐ First Come First Served Solicitation

1. Exhibit A, Scope of Work		☒ Attached
2. Exhibit B, Budget Detail		☒ Attached
3. CEC 105, Questionnaire for Identifying Conflicts		☒ Attached
4. Recipient Resolution	☒ N/A	☐ Attached
5. CEQA Documentation	☐ N/A	☒ Attached

Agreement Manager	**Date**	**Office Manager**	**Date**	**Deputy Director**	**Date**

Exhibit A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Identify Basins and Collect Samples
3		Analyze Samples
4		Repeat Tasks 2 and 3 For Each Selected Natural Gas Basin
5	X	Define Fingerprint
6		Publish Results
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is for the Regents of the University of California, on behalf of the Irvine Campus, to develop a fingerprinting technique to determine the basin of origin for any natural gas emissions and to create a database of natural gas hydrocarbon composition.

B. Problem/ Solution Statement

Problem

Natural gas leaks can cause various problems, from enhancing the greenhouse effect to raising the concentration of carcinogens in the atmosphere. There are many basins in the U.S. from which natural gas is sourced; the gas from each basin has a different chemical makeup, and thus can cause different issues. Currently, there is no method to determine the origin of the gas at the source of the leak. Because of this, the State of California does not currently have the ability to choose whether to import from sources that are higher contributors of greenhouse gases or airborne toxic hydrocarbons as this information has not yet been collected.

[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

Solution
The Recipient will develop a fingerprinting technique for natural gas that can be used to determine the basin of origin for a given sample and will upload all results to an online public database. This will allow full life-cycle accounting of the greenhouse gas footprint of any natural gas consumed in California, as any gas leak can be tested and compared to the database of basin fingerprints. The database can also be used to compare the overall composition of each natural gas source, in order to provide information on which chemicals and what quantity would be released in the event of a leak, both for informed import choices and for hastening response in the event of an emergency.

C. Goals and Objectives of the Agreement

Agreement Goals
The goals of this Agreement are to:

- Deliver a method for full life-cycle accounting of the greenhouse gas footprint in California;
- Create a database that can aid in emergency response to natural gas leaks; and
- Increase awareness of the difference in natural gas composition from one source to another.

Ratepayer Benefits: This Agreement will result in the ratepayer benefit of increased safety by giving a quantified understanding of what hazards are present in the natural gas consumed by ratepayers.

Technological Advancement and Breakthroughs: 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 contributing to full life-cycle accounting of methane, a substantial greenhouse gas. This project will provide a framework for calculating total methane emissions related to natural gas use in California, and will fulfill the requirements of California Assembly Bill 1496 (to carry out "life-cycle greenhouse gas emission analysis of natural gas used and imported into the state using the best available and cost-effective scientific and technical methods".)

Agreement Objectives
The objectives of this Agreement are to:

- Obtain and analyze natural gas samples from a representative sample of U.S. producing basins;
- Develop a fingerprinting method that can distinguish between geographical sources of natural gas in the United States;
- Quantify the greenhouse gas and toxic hydrocarbon concentration of each source;
- Confirm scientific validity of results through peer-reviewed articles and abstracts; and
- Make all data and results available to the public via an online database.
- Coordinate with Lawrence Berkeley National Laboratory (LBNL) with its project under Agreement PIR-17-010, as appropriate.

III. 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, including the Final Report Outline and Final Report

- 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.
- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

- Submit the product to the CAM for acceptance. The CAM may request minor revisions or explanations prior to acceptance.

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software:

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

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

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

- 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.

o **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.
- C# Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

  The administrative portion of the meeting will include discussion of the following:
  - o Terms and conditions of the Agreement;
  - o Administrative products (subtask 1.1);
  - o CPR meetings (subtask 1.3);
  - o Match fund documentation (subtask 1.7);
  - o Permit documentation (subtask 1.8);
  - o Subcontracts (subtask 1.9); and
  - o Any other relevant topics.

The technical portion of the meeting will include discussion of the following:
- o The CAM's expectations for accomplishing tasks described in the Scope of Work;
- o An updated Project Schedule;
- o Technical products (subtask 1.1);
- o Progress reports and invoices (subtask 1.5);
- o Final Report (subtask 1.6);
- o Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
- o Any other relevant topics.

- Provide an *Updated Project Schedule, List of Match Funds,* and *List of Permits*, as needed to reflect any changes in the documents.

The CAM shall:
- Designate the date and location of the meeting.
- Send the Recipient a Kick-off Meeting Agenda.

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

CAM Product:
- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings
The goal of this subtask is to determine if the project should continue to receive Energy Commission funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the Energy Commission and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient, and may include the CAO and any other individuals selected by the CAM to provide support to the Energy Commission.

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

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

- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

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

Recipient Products:

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

CAM Products:

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

Subtask 1.4 Final Meeting

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

The Recipient shall:

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

  The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.
  - The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
  - The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
    - Disposition of any state-owned equipment.
    - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.

  - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
  - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
  - "Surviving" Agreement provisions such as repayment provisions and confidential products.
  - Final invoicing and release of retention.

- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:
- Submit a monthly *Progress Report* to the CAM. Each progress report must:
  - Summarize progress made on all Agreement activities as specified in the scope of work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and 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.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions, including a financial report on Match Fund and in-state 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 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 the 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. *(See Task 1.1 for requirements for draft and final products.)*

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - o Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
  - o Ensure that the document is written in the third person.
  - o Ensure that the Executive Summary is understandable to the lay public.
    - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
    - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
    - If it is necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
  - o Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.

- o Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- o Include a brief description of the project results in the Abstract.

- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:
- Final Report (draft and final)
- Written Responses to Comments on the Draft Final Report

CAM Product:
- Written Comments on the Draft Final Report

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

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

Subtask 1.8 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts
The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)
The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

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

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members, including a representative from LBNL in order to coordinate activities and information sharing with LBNL for its activities under Agreement PIR-17-010. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

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

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

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

IV. TECHNICAL TASKS

*Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. **Subtask 1.1 (Products)** describes the procedure for submitting products to the CAM.*

TASK 2: IDENTIFY BASINS AND COLLECT SAMPLES
The goal of this task is to obtain whole air samples from each selected natural gas basin in the U.S.

The Recipient shall:
- Provide a *Draft Map and Numbered Listing of U.S. Natural Gas Basins* to be visited for sampling, to include, but not be limited to the name of the basin, expected days to be spent at the basin and number of staff needed for the trip.
- Incorporate CAM feedback and provide a *Final Map and Numbered Listing of U.S. Natural Gas Basins* to be visited for sampling. The basins selected for sampling shall be subject to prior CAM written approval.
- Travel to each basin on the final approved list which has current natural gas production.
- Collect approximately 5 "clean air" samples upwind of natural gas production.
- Collect 15-35 additional samples downwind of natural gas production wells, gathering stations, and compressors.
- Send samples for hydrocarbon composition analysis.
- Transfer approximately 12mL of each sample from whole air sampling canister to glass vial.
- Send approximately 12mL glass vials for isotopic ration analysis of methane.
- Prepare a *Draft Sample Collection Report* listing the sample numbers, geographic sampling locations, and any other pertinent information (for example, "Near gathering pipeline", or "Downwind of Well #5".).
- Upon direction from CAM, share obtained samples with LBNL for the purposes of LBNL's project activities under Agreement PIR-17-010.

Products:
- Map and Numbered Listing of U.S. Natural Gas Basins (draft and final)
- Draft Sample Collection Report

TASK 3: ANALYZE SAMPLES
The goal of this task is to obtain the chemical composition and isotopic composition of methane from collected samples.

The Recipient shall:

- Prepare a *Draft Sample Analysis Methods Report* which outlines and explains the analysis methods, including but not limited to, hydrocarbon composition analysis, hydrogen isotopic ratio analysis in methane, and carbon isotopic ratio analysis in methane.
- Run whole air hydrocarbon composition analysis
- Run hydrogen isotopic ratio analysis of methane.
- Run carbon isotopic ratio analysis of methane.
- Prepare a *Revised Sample Analysis Methods Report* to include any changes in analysis procedures compared to the methods outlined and explained in the *Draft Sample Analysis Methods Report* that may have been required during the testing process (if applicable).

Products:

- Draft Sample Analysis Methods Report
- Revised Sample Analysis Methods Report (if applicable)

TASK 4: REPEAT TASKS 2 AND 3 FOR EACH SELECTED NATURAL GAS BASIN

The goal of this task is to collect representative samples from the producing basins identified and listed on the map produced under Task 2.

The Recipient shall:

- Repeat the analysis activities listed in Tasks 2 and 3 for each basin identified and listed on the map produced under Task 2.
- Generate a *Final Sample Collection Report* to include, but not be limited to, the basin name, the sample numbers, geographic sampling locations, and any other pertinent information.
- Provide a *Sample Analysis Report* containing the name of basin where samples were collected, sample numbers, and the results of sample analysis for each basin visited.
- Update and submit the *Final Sample Analysis Methods Report* which outlines and explains the final analysis methods, including but not limited to, hydrocarbon composition analysis, hydrocarbon isotopic ratio analysis in methane and carbon isotopic ratio analysis in methane.

Products:

- Final Sample Collection Report
- Sample Analysis Report (draft and final)
- Final Sample Analysis Methods Report

TASK 5: DEFINE FINGERPRINT

The goals of this task are to (1) determine which analyzed parameters are most useful in differentiating natural gas from one basin to another, and (2) show reproducibility of fingerprinting results.

The Recipient shall:

- Compare chemical and/or isotopic composition of natural gas samples from each studied basin and identify what constituents can be used for source apportionment in mixtures of natural gas from several different basins.
- Define a fingerprinting method that can be used to distinguish the origin of a given natural gas sample based on the analysis results.
- Test the fingerprinting method by classifying all collected samples based on fingerprinting parameters.
- Prepare a *Fingerprinting Report* containing fingerprinting method and results.
- Prepare a *CPR Report* and participate in a CPR meeting in accordance with Subtask 1.3 (CPR Meetings).

Products:

- Fingerprinting Report
- CPR Report

TASK 6: PUBLISH RESULTS

The goal of this task is to publish the results of the project and to make the results available to the public.

The Recipient shall:

- Prepare one or more *Journal Articles* with the results of the project to be submitted to peer-reviewed journals. Notify CAM prior to submitting results of the project to peer-reviewed journals.
- Prepare one or more *Abstracts* to be submitted to relevant meetings and conferences where the project results may be the subject of a poster or talk. Notify CAM prior to the presentation of any project results.
- Prepare any relevant *Press Releases* with the project results, as needed. All *Press Releases* shall be approved by CAM in writing prior to being released to the press.

Products:

- Journal Article(s) (draft and final)
- Abstract(s) (draft and final)
- Press Release(s) (draft and final)

TASK 7: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission

reduction calculations. Examples of information that may be requested in the questionnaires include:

- <u>For Product Development Projects and Project Demonstrations:</u>
  - 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.
  - <u>Additional Information for Product Development Projects</u>:
    - 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.
  - <u>Additional Information for Product Demonstrations</u>:
    - Outcome of demonstrations and status of technology.
    - Number of similar installations.
    - Jobs created/retained as a result of the Agreement.

- <u>For Information/Tools and Other Research Studies:</u>
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.

  - A discussion of project product downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

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

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

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:
- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
  - o 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.
  - o A description of the intended use(s) for and users of the project results.
  - o Published documents, including date, title, and periodical name.
  - o 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.
  - o A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
  - o The number of website downloads or public requests for project results.
  - o 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(s) on the project.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:
- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 18-0411-9a

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: UNIVERSITY OF CALIFORNIA, IRVINE

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 PIR-17-011 from GFO-17-502 with University of California, Irvine for $550,000, to analyze natural gas samples collected at major natural gas basins in the U.S. for their chemical and isotopic composition, and to develop a methodology enabling identification of the basin of origin. Results from this research will support life-cycle accounting of methane emissions from the natural gas supply chain; 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 11, 2018.

AYE: [List of Commissioners]
NAY: [List of Commissioners]
ABSENT: [List of Commissioners]
ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat