

CONTRACT REQUESTS FORM (CRF)

CEC-94 (Revised 5/11)

CALIFORNIA ENERGY COMMISSION


 New Contract _____ Amendment to Existing Contract: _____ Amendment Number: _____

Division	Contract Manager:	MS-	Phone	CM Training Date
ERDD - Environmental Area	Simone Brant	43	916-327-2201	7/11/2012

Contractor's Legal Name	Federal ID Number
The Regents of the University of California, Davis	94-6036494

Title of Project
Top-Down Quantification of Methane Emissions from California's Natural Gas System

Term	Start Date	End Date	Amount
New/Original Contract	6/30/2013	6/30/2015	\$ 900,000

Line up the Amendment information as best as possible within the following table.

Amendment #	End Date (mm/dd/yy)	Amount

Business Meeting Information

Proposed Business Meeting Date	4/30/2013	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Simone Brant	Time Needed:	5 minutes

Agenda Item Subject and Description

UC DAVIS. Possible approval of Agreement 500-12-006 with the Regents of the University of California on behalf of the Davis campus for \$900,000 Interagency Agreement to conduct a comprehensive investigation of emissions and leakages across the sub-sectors of California's natural gas infrastructure. Measurements will be taken for all significant source sectors for building, neighborhood, facility, and regional settings. The baseline measurements will identify promising areas for mitigation activities and a means to verify their success. (PIER natural gas funding) Contact: Simone Brant. (5 minutes)

Business Meeting approval is not required for the following types of contracts: *Executive Director's signature is required in all cases.*

- Contracts less than \$10k (*Policy Committee's signature is also required*)
- Amendment for a no-cost time extension. Must be first extension, less than one year and original contract less than \$100k.
- Contracts less than \$25k for Expert Witness in Energy Facility licensing cases and amendments.

Purpose of Contract or Purpose of Amendment, if applicable

The goal of this project is to quantitatively survey methane emissions across the sub-sectors of California's natural gas infrastructure (e.g. transmission lines, natural gas facilities, homes) to estimate major sources of fugitive emissions. Studies suggest that fugitive methane emissions from the natural gas system are underestimated, but it is unclear which sources are underreported and to what extent. This project will attempt to identify the responsible sources.

California Environmental Quality Act (CEQA) Compliance

- Is Contract considered a "Project" under CEQA?
 - Yes: skip to question 2
 - No: complete the following (PRC 21065 and 14 CCR 15378):

Explain why contract is not considered a "Project":
- If contract is considered a "Project" under CEQA:
 - a) Contract **IS** exempt. (Draft NOE required)
 - Statutory Exemption. List PRC and/or CCR section number: _____
 - Categorical Exemption. List CCR section number: 14 CCR 15306
 - Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why contract is exempt under the above section:
The project involves measuring methane emissions at various sources to identify mitigation strategies.
 - b) Contract **IS NOT** exempt. The Contract Manager needs to consult with the Energy Commission attorney assigned to their division and the Siting Office regarding a possible Initial Study.

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Budgets Information								
Contract Amount Funded		Breakdown by FY			Funding Sources			
Funding Source	Amount	FY	Amount	Approved?	Funding Source	FY	Budget List No.	Amount
ARFVTF	\$	12-13	\$900,000	Yes	NG Subaccount, PIERDD	11-12	501.001F	\$900,000
ECAA	\$		\$					\$
State- ERPA	\$		\$					\$
Federal	\$		\$					\$
PIER - E	\$		\$					\$
PIER - NG	\$900,000		\$					\$
Reimbursement	\$		\$					\$
Other	\$		\$					\$
TOTAL: \$900,000		TOTAL: \$900,000			TOTAL:			\$900,000
Reimbursement Contract #:					Federal Agreement			

Contractor's Administrator/ Officer		Contractor's Project Manager	
Name:	Ahmad Hakim-Elahi	Name:	Marc Fischer
Address:	1 Shields Avenue University of California	Address:	1 Shields Avenue University of California
City, State, Zip:	Davis, CA 95616-8500	City, State, Zip:	Davis, CA 95616-5294
Phone/ Fax:	530-752-2075 / 530-752-5432	Phone/ Fax:	510-486-5539 / 510-486-5928
E-Mail:	awards@ucdavis.edu	E-Mail:	mfischer@lbl.gov

Contractor Is

Private Company (including non-profits)

CA State Agency (including UC and CSU)

Government Entity (i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state)

Selection Process Used

Solicitation Select Type Solicitation #: _____ # of Bids: _____ Low Bid? No Yes

Non Competitive Bid (Attach CEC 96)

Exempt Interagency

Civil Service Considerations

Not Applicable (Contract is with a CA State Entity or a membership/co-sponsorship)

Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)

The Services Contracted:

- are not available within civil service
- cannot be performed satisfactorily by civil service employees
- are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system.

The Services are of such an:

- urgent
- temporary, or
- occasional nature

that the delay to implement under civil service would frustrate their very purpose.

Justification:
The contract is an interagency agreement which is exempt from civil service considerations.

Payment Method

A. Reimbursement in arrears based on:

- Itemized Monthly
- Itemized Quarterly
- Flat Rate
- One-time

B. Advanced Payment

C. Other, explain:

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Retention	
1. Is contract subject to retention?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
If Yes, Do you plan to release retention prior to contract termination?	<input type="checkbox"/> No <input type="checkbox"/> Yes

Justification of Rates
The rates identified in this contract are consistent with the standard negotiated rates between the University of California and the Energy Commission.

Disabled Veteran Business Enterprise Program (DVBE)	
1. <input checked="" type="checkbox"/> Not Applicable	
2. <input type="checkbox"/> Meets DVBE Requirements	DVBE Amount:\$ _____ DVBE %: _____
<input type="checkbox"/> Contractor is Certified DVBE	
<input type="checkbox"/> Contractor is Subcontracting with a DVBE:	_____
3. <input type="checkbox"/> Requesting DVBE Exemption (attach CEC 95)	

Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
If yes, check appropriate box:	<input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE

Is Contractor subcontracting any services?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
If yes, give company name and identify if they are a Small Business (SB), Micro Business (MB) and/or DVBE:	
DOE- Lawrence Berkeley National Laboratory	<input checked="" type="checkbox"/> No <input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE
Trustees of the California State University - San Jose	<input checked="" type="checkbox"/> No <input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE
University of California, Irvine	<input checked="" type="checkbox"/> No <input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE
Picarro, Inc.	<input checked="" type="checkbox"/> No <input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE

Miscellaneous Contract Information	
1. Will there be Work Authorizations?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
2. Is the Contractor providing confidential information?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
3. Is the contractor going to purchase equipment?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
4. Check frequency of progress reports	
<input type="checkbox"/> Monthly <input checked="" type="checkbox"/> Quarterly <input type="checkbox"/> _____	
5. Will a final report be required?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
6. Is the contract, with amendments, longer than a year? If yes, why?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
The Department of General Services has agreed to give the Commission blanket authority to execute multi-year contracts to support the Commission's RD&D Programs.	

The following items should be attached to this CRF		
1. Scope of Work, Attach as Exhibit A.	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached	
2. Budget Detail, Attach as Exhibit B.	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached	
3. CEC 96, NCB Request	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached	
4. CEC 30, Survey of Prior Work	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached	
5. CEC 95, DVBE Exemption Request	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Attached	
6. Draft CEQA Notice of Exemption (NOE)	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached	
7. Resumes	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached	
8. CEC 105, Questionnaire for Identifying Conflicts	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Attached	

Contract Manager _____ Date _____ Office Manager _____ Date _____ Deputy Director _____ Date _____

The following signatures are only required when contract approval is delegated to the Executive Office and not approved at a Business Meeting. See Business Meeting Information Section.

_____ Executive Director _____ Date _____

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SCOPE OF WORK

TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2		Regional Scale Speciation of Natural Gas Emissions
3		Facility Scale Natural Gas Production and Processing Emissions
4		Transmission and Distribution Scale Natural Gas Emissions
5		Development of System for Building Scale Emission Measurement (SBSEM)

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Fischer, UC Davis	Lawrence Berkeley National Laboratory (LBNL)	
2	Fischer	LBNL	National Oceanic and Atmospheric Administration Earth System Research Laboratory
3	Fischer, Conley, UC Davis	LBNL UC Irvine	
4	Fischer, Conley	LBNL, Picarro, Inc.	
5	Fischer	LBNL	

GLOSSARY

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

Acronym	Definition
CCM	Commission Contract Manager
CH ₄	Methane
CO ₂	Carbon Dioxide
CPR	Critical Project Review
DOE	US Department of Energy
Energy Commission	California Energy Commission
LBNL	Lawrence Berkeley National Laboratory
NOAA-ESRL	National Oceanic and Atmospheric Administration Earth System Research Laboratory
PIER	Public Interest Energy Research
SBSEM	System for Building Scale Emission Measurement
UCC.1	Uniform Commercial Code (Financing Statement)
VOC	Volatile Organic Compound

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Problem Statement

Emissions of natural gas from California's energy infrastructure are estimated to be ~ 50 billion ft³/yr or ~ 2% of total consumption¹. Identifying and controlling these emissions will have a positive impact on local safety, regional air quality, and the global climate. The Public Interest Energy Research (PIER) program is funding research on mitigation strategies for up-stream production and processing of natural gas in California through contract 500-11-027 with Lawrence Berkeley National Laboratory (LBNL). However, because emissions will occur throughout different sub-sectors of the natural gas system (including production, processing, transmission, distribution, and consumption), a coherent effort to quantify emissions across California's infrastructure is necessary to plan and subsequently evaluate the success of a full suite of mitigation efforts.

Previous PIER research conducted via contract 500-08-019, which quantified total emissions of methane ("CH₄", the dominant constituent of natural gas) from Central California, suggested that they are higher than current inventory estimates. However, attributing a specific portion of the emitted CH₄ to natural gas infrastructure is challenging because CH₄ is also derived from biological source sectors such as livestock, landfills, natural wetlands, and rice agriculture.

The problem of attribution at regional scales can be addressed through a combination of multi-species measurements that separate the source sectors responsible for emissions and spatially specific sampling that pinpoints emissions to specific areas or even facilities. For example, recent work in the South Coast air basin used measurements of multiple alkane tracers (i.e., ethane, propane, and butane) to identify the component of CH₄ emissions associated with natural gas and petroleum activities², but did not pinpoint the source of leakage to differentiate between "upstream" production, processing, and transmission, and "downstream" distribution and consumption infrastructure.

This project involves the measurement of natural gas CH₄ emissions. The recipient will:

- Perform tall-tower measurements of CH₄ and selected volatile organic compounds (VOCs) for attribution of regional CH₄ emissions to the natural gas and petroleum sectors;
- Develop low-cost airborne observations as a tool for repeated quantitative surveys of California's natural gas infrastructure;
- Augment an automobile survey technique that involves equipping small cars with stable isotopic CH₄ analyzers; and
- Combine high precision measurements of building airflow and time-resolved isotopic CH₄ gas measurements to quantify the mass flow of natural gas CH₄ leaking into buildings in an approach termed as a System for Building Scale

¹ CEC. 2011. *Energy Almanac*, <http://energyalmanac.ca.gov/naturalgas/index.html>

² Wennberg, P. O., W. Mui, D. Wunch, E. A. Kort, D. R. Blake, E. L. Atlas, G. W. Santoni, S. C. Wofsy, G. S. Diskin, S. Jeong and M. L. Fischer. 2012. On the Sources of Methane to the Los Angeles Atmosphere. *Environmental Science & Technology*. 10.1021/es301138y.

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Emission Measurement (SBSEM). The SBSEM approach does not rely on modeling and instead provides a direct mass-balance measurement of CH₄ leakage estimates as the product of the measured air flow and measured indoor-outdoor CH₄ enhancement developed in controlled streams of forced air.

Goals of the Agreement

The goal of this project is to quantitatively survey methane emissions across the sub-sectors of California's natural gas infrastructure, providing baseline measurements that identify promising areas for mitigation activities and provide a means to verify their success.

Objectives of the Agreement

The objectives of this Agreement are to quantify natural gas emissions for all significant source sectors for building, neighborhood, facility, and regional settings.

The technical performance measures upon which this project's success will be evaluated are:

- Development and demonstration of methods to quantify natural gas emissions for each important sub-sector of California's natural gas sources; and
- Quantification of natural gas emissions across important sub-sectors within sample regions of California.

TASK 1.0 ADMINISTRATION

MEETINGS

Task 1.1 Attend Kick-off Meeting

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

The Contractor shall:

- Attend a "kick-off" meeting with the Commission Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Commission Contract Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Contract Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

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- Terms and conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7) - *Not applicable to this project*
- Permit documentation (Task 1.8) - *Not applicable to this project*
- Establish the TAC (Task 1.10)
- TAC Meetings (Task 1.11)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Contract Manager's expectations for accomplishing tasks described in the Scope of Work;
- An updated Schedule of Deliverables
- Progress Reports (Task 1.4)
- Technical Deliverables (Task 1.5)
- Final Report (Task 1.6)
- Establish the TAC (Task 1.10)
- TAC Meetings (Task 1.11)

The Commission Contract Manager shall designate the date and location of this meeting.

Contractor Deliverables:

- An Updated Schedule of Deliverables
- An Updated List of Match Funds - *Not applicable to this project*
- An Updated List of Permits - *Not applicable to this project*

Commission Contract Manager Deliverables:

- Final Report Instructions

TASK 1.2 CPR Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Contract Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Commission Contract Manager may schedule additional CPRs as necessary, and, if necessary, the budget will be reallocated to cover the additional costs borne by the Contractor, but the overall contract amount will not increase.

Participants include the Commission Contract Manager and the Contractor, and may include the Commission Contracts Officer, the PIER Program Team Lead, other Energy

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Commission staff and Management as well as other individuals selected by the Commission Contract Manager to provide support to the Energy Commission.

The Commission Contract Manager shall:

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

The Contractor shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the Commission Contract Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Contractor Deliverables:

- CPR Report(s)
- CPR deliverables identified in the Scope of Work

Commission Contract Manager Deliverables:

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

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Task 1.3 Final Meeting

The goal of this task is to close out this Agreement.

The Contractor shall:

- Meet with the Energy Commission 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, at a minimum, the Contractor, the Commission Contracts Officer, and the Commission Contract Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Contract Manager.

The technical portion of the meeting shall include the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The Commission Contract Manager will determine the appropriate meeting participants.

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

- What to do with any state-owned equipment (Options)
- Need to file UCC.1 form re: Energy Commission's interest in patented technology
- Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
- Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
- Final invoicing and release of retention
- Preparation of a schedule for completing the closeout activities for this Agreement.

Deliverables:

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

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REPORTING

See Exhibit D, Reports/Deliverables/Records.

Task 1.4 Quarterly Progress Reports

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

The Contractor shall:

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

Deliverables:

- Quarterly Progress Reports

Task 1.5 Test Plans, Technical Reports and Interim Deliverables

The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

The Contractor shall:

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

Task 1.6 Final Report

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work performed under this Agreement. The Commission Contract Manager will review and approve the Final

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Report. The Final Report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

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

Task 1.6.1 Final Report Outline

The Contractor shall:

- Prepare a draft outline of the Final Report.
- Submit the draft outline of Final Report to the Commission Contract Manager for review and approval. The Commission Contract Manager will provide written comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

Deliverables:

- Draft Outline of the Final Report
- Final Outline of the Final Report

Task 1.6.2 Final Report

The Contractor shall:

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the Commission Contract Manager for review and comment. The Commission Contract Manager will provide written comments within 10 working days of receipt.

Once agreement on the draft Final Report has been reached, the Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Commission Contract Manager shall provide written approval to the Contractor within 5 working days.

- Submit one bound copy of the Final Report with the final invoice.

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Deliverables:

- Draft Final Report
- Final Report

MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT

Task 1.7 Identify and Obtain Matching Funds *(If Applicable)*

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

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

The Contractor shall:

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

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

Deliverables:

- A letter regarding Match Funds or stating that no Match Funds are provided
- Letter(s) for New Match Funds
- A copy of each Match Fund commitment letter
- Letter that Match Funds were Reduced (if applicable)

Task 1.8 Identify and Obtain Required Permits (*If Applicable*)

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

Permit costs and the expenses associated with obtaining permits are reimbursable under this Agreement. Permits must be identified in writing before the Contractor can incur any costs related to the use of the permit(s) for which the Contractor will request reimbursement.

The Contractor shall:

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

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

Deliverables:

- A letter documenting the Permits or stating that no Permits are required
- Updated list of Permits as they change during the Term of the Agreement
- Updated schedule for acquiring Permits as it changes during the Term of the Agreement
- A copy of each approved Permit

Task 1.9 Electronic File Format

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

The Contractor shall:

- Deliver documents to the CCM in the following formats:
 - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
 - PC-based text documents shall be in MS Word file format.
 - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
 - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

Deliverables:

- A letter requesting exemption from the Electronic File Format (if applicable)

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TAC

Task 1.10 Establish a TAC (*If Applicable*)

The goal of this task is to create an advisory committee for this Agreement.

The TAC should be composed of diverse professionals including gas utilities representatives. The number can vary depending on potential interest and time availability. The exact composition of the TAC may change as the need warrants. TAC members serve at the discretion of the CCM.

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

- Researchers knowledgeable about the project subject matter
- Members of the trades who 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 project subject matter
- U.S. Department of Energy Research Manager
- Public Interest Environmental Groups
- Utility Representatives
- Members of the relevant technical society committees

The purpose of the TAC is to:

- Provide guidance in research direction. The guidance may include scope of research; research methodologies; timing; coordination with other research. The guidance may be based on:
 - technical area expertise
 - knowledge of market applications
 - linkages between the agreement work and other past, present or future research (both public and private sectors) they are aware of in a particular area.
- Review deliverables. Provide specific suggestions and recommendations for needed adjustments, refinements, or enhancement of the deliverables.
- Evaluate tangible benefits to California of this research and provide recommendations, as needed, to enhance tangible benefits.
- Provide recommendations regarding information dissemination, market pathways or commercialization strategies relevant to the research products.

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The Contractor shall:

- Prepare a draft list of potential TAC members that includes name, company, physical and electronic address, and phone number and submit it to the CCM at least 2 working days prior to the kick-off meeting. This 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 and ensure that each individual understands the member obligations described above, as well as the meeting schedule outlined in Task 1.11.
- Prepare the final list of TAC members.
- Submit letters of acceptance or other comparable documentation of commitment for each TAC member.

Deliverables:

- Draft List of TAC Members
- Final List of TAC Members
- Letters of acceptance, or other comparable documentation of commitment for each TAC Member

Task 1.11 Conduct TAC Meetings (If Applicable)

The goal of this task is for the TAC to provide strategic guidance to this project by participating in regular meetings or teleconferences.

The Contractor shall:

- Discuss the TAC meeting schedule at the kick-off meeting. The number of face-to-face meetings and teleconferences and the location of TAC meetings shall be determined in consultation with the CCM. This draft schedule shall be presented to the TAC members during recruiting and finalized at the first TAC meeting.
- Organize and lead TAC meetings in accordance with the schedule. Changes to the schedule must be pre-approved in writing by the CCM.
- Prepare TAC meeting agenda(s) with back-up materials for agenda items.
- Prepare TAC meeting summaries, including recommended resolution of major TAC issues.

Deliverables:

- Draft TAC Meeting Schedule
- Final TAC Meeting Schedule
- TAC Meeting Agenda(s) with Back-up Materials for Agenda Items
- Written TAC meeting summaries, including recommended resolution of major TAC issues

Exhibit A

SCOPE OF WORK

TECHNICAL TASKS

TASK 2 Regional Scale Speciation of Natural Gas Emissions

The goal of this task is to apply tower-based speciation of CH₄ emissions at an existing tower greenhouse gas measurement site to quantify the natural gas and petroleum component of CH₄ emissions.

The Contractor shall:

- Prepare a technical memorandum entitled “Measurement Plan for Regional Scale Speciation of Natural Gas Emissions” that discusses plans for regional scale sampling, including methods, schedule, and locations.
- Augment CH₄ measurements at a tower site to include stable isotopic and selected VOC measurements.
- Collect one-year time CH₄ and multi-tracer time series measurements.
- Partition CH₄ signals using multi-factor decomposition of CH₄ and VOC tracers.
- Perform atmospheric inversion of emissions specific to natural gas and petroleum activities.
- Prepare a technical memorandum entitled “Regional Scale Speciation of Natural Gas Emissions” that discusses findings from CH₄ measurements and inverse model estimate of emissions from natural gas and petroleum sources.
- Create a CD containing a one-year data record of CH₄, stable isotopes, and VOC measurements.

Deliverables:

- Measurement Plan for Regional Scale Speciation of Natural Gas Emissions technical memorandum (no draft)
- “Regional Scale Speciation of Natural Gas Emissions” technical memorandum (no draft)
- CD containing a one year data record of CH₄, stable isotopes and VOC measurements

TASK 3 Estimate Facility Scale Natural Gas Production and Processing Emissions

The goal of this task is to estimate total CH₄ emissions for 3 to 4 representative natural gas production and processing facilities across California. To the extent possible, this task will be coordinated with an existing PIER project which aims to measure and evaluate fugitive methane emissions from the California natural gas system³.

The Contractor shall:

- Identify a sample of natural gas facilities (varied age and total production), and plan an observational program for mobile observations.

³ Agreement Number 500-11-027, “Evaluation of Opportunities to Mitigate Fugitive Methane Emissions from the California Natural Gas System.”

Exhibit A

SCOPE OF WORK

- Prepare a technical memorandum entitled “Measurement Plan for Estimating Facility-Level Methane Emissions Using Mobile Platforms” that discusses plans for facility scale sampling, including methods, schedule, and locations.
- Competitively award a subcontract for identification of methane “hotspots” and upwind emissions (for both Tasks 3 and 4).
- Conduct repeated airborne and ground based measurements of stable isotopic CH₄ and total VOC concentrations and surface and boundary layer meteorology characterizing advective air flows and boundary layer mixing depth surrounding each facility as described in plan for estimating facility-level emissions.
- Estimate CH₄ emissions and uncertainties for each facility.
- Compare top-down facility-scale emissions with available bottom-up emission sums and estimate emission factors in ratio to reported facility production.
- Revise state-total CH₄ emissions estimates for natural gas facilities using revised emission factors and reported production.
- Prepare a technical memorandum entitled “Facility Scale Natural Gas Production and Processing Emissions” that presents results of CH₄, VOC, and meteorological measurements, mass balance estimates of CH₄ emissions for measured facilities, and revised emission factors and state-total emissions from scaling to production.
- Create a CD containing measured CH₄, VOC, and meteorological data from field campaigns at natural gas facilities.

Deliverables:

- “Measurement Plan for Estimating Facility-Level Methane Emissions Using Mobile Platforms” technical memorandum (no draft)
- “Facility Scale Natural Gas Production and Processing Emissions” technical memorandum (no draft)
- CD containing measured CH₄, VOC, and meteorological data from field campaigns at natural gas facilities

Task 4 Survey Transmission and Distribution Scale Natural Gas Emissions

The goal of this task is to survey CH₄ emissions from sample sections of the transmission and distribution system infrastructure in California.

The Contractor shall:

- Identify areas where a subset of natural gas transmission lines and (likely sub-urban) distribution infrastructure can be measured using the mobile techniques described in Task 3.
- Prepare a technical memorandum entitled “Measurement Plan for Estimating Transmission and Distribution Scale Natural Gas Emissions” that discusses plans for transmission and distribution scale sampling, including methods, schedule, and locations.
- Perform mobile airborne and ground-based natural gas emission measurement campaigns for sample areas.

Exhibit A

SCOPE OF WORK

Estimate emissions and emission factors relative to transmission and distribution volumes.

- Prepare a technical memorandum entitled “Transmission and Distribution Scale Natural Gas Emissions” that presents results of CH₄ and related tracer and meteorological measurements from survey campaigns, and estimated emissions and emission factors for transmission and distribution for sampled areas.
- Create a CD containing measured CH₄ and related tracer and meteorological data sets from survey campaigns.

Deliverables:

- “Measurement Plan for Estimating Transmission and Distribution Scale Natural Gas Emissions” technical memorandum (no draft)
- “Transmission and Distribution Scale Natural Gas Emissions” technical memorandum (no draft)
- CD containing measured CH₄ and related tracer and meteorological data sets from survey campaigns

Task 5 Development of System for Building Scale Emission Measurement (SBSEM)

The goal of this task is to develop and demonstrate the SBSEM method to quantify CH₄ emissions from residential and commercial structures.

The Contractor shall:

- Prepare a technical memorandum entitled “Measurement Plan for Natural Gas Emissions in California Buildings” that discusses plans for building scale sampling, including methods, schedule, and locations.
- Identify 10 to 20 buildings in Central California and apply the SBSEM method to estimate building scale natural gas leakage according to sampling strategy.
- Compare measured emissions with building-specific and household average annual gas consumption to estimate emission factors.
- Review the California building stock to identify a preliminary sampling strategy for a state-wide building emissions survey.
- Prepare a technical memorandum entitled “Building Scale Natural Gas Emissions” that presents results of SBSEM measurements and estimated emissions and emission factors estimates for sampled buildings.
- Create a CD containing measured building leakage data, emissions estimates, and emission factor estimates.

Deliverables:

- Technical memorandum: “Measurement Plan for Natural Gas Emissions in California Buildings” (no draft)
- Technical memorandum: “Building Scale Natural Gas Emissions” (no draft)
- CD containing measured building leakage data, emission and emission factor estimates