

CONTRACT REQUEST FORM (CRF)

CEC-94 (Revised 01/13)

CALIFORNIA ENERGY COMMISSION

A) New Agreement 500-13-005 (To be completed by CGL Office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Simone Brant	43	916-327-2201

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

D) Title of Project
Improvement of an Airborne Natural Gas Leak-Detection System

E) Term and Amount	Start Date	End Date	Amount
	3/17/2014	6/17/2016	\$ 300,000

F) Business Meeting Information
 Operational agreement (see CAM Manual for list) to be approved by Executive Director

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

Proposed Business Meeting Date	2/12/2014	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Simone Brant	Time Needed:	5 minutes

Please select one list serve. Select

Agenda Item Subject and Description

UC DAVIS. Possible approval of Contract 500-13-xxx for \$300,000 with The Regents of the University of California, on behalf of the Davis Campus for improvement of an airborne system for detection of leaks from natural gas transmission pipelines. (PIER natural gas funding) Contact: Simone Brant. (5 minutes)

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
 Yes (skip to question 2) No (complete the following (PRC 21065 and 14 CCR 15378)):
 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: 14 CCR Section 15306

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

Explain reason why Agreement is exempt under the above section:

Class 6 - Basic data collection, research, experimental management, and resource evaluation activities that do not result in major disturbances to an environmental resource.

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

Check all that apply

 Initial Study

 Environmental Impact Report

 Negative Declaration

 Statement of Overriding Considerations

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

Legal Company Name:	Budget	SB	MB	DVBE
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I) List all key partners: (attach additional sheets as necessary)

Legal Company Name: Pacific Gas and Electric Company

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	12-13	501.001G	\$300,000
R&D Program Area: EGRO: EA		TOTAL:	\$
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

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CALIFORNIA ENERGY COMMISSION



k) Contractor's Administrator/ Officer				Contractor's Project Manager			
Name:	Ahmad Hakim-Elahi			Name:	Stephen Conley		
Address:	1 SHIELDS AVE			Address:	1 SHIELDS AVE		
City, State, Zip:	DAVIS, CA 95616-8500			City, State, Zip:	DAVIS, CA 95616-5270		
Phone:	530-754-7700 /	Fax:	- -	Phone:	/	Fax:	- -
E-Mail:	awards@ucdavis.edu			E-Mail:	saconley@ucdavis.edu		

L) Selection Process Used (For amendments, address amendment exemption or NCB, do not identify solicitation type of original agreement.)

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

Non Competitive Bid (Attach CEC 96)

Exempt Interagency

M) Contractor Entity Type

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)

N) Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE? No Yes

If yes, check appropriate box: SB MB DVBE

O) Civil Service Considerations

Not Applicable (Agreement 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.

P) Payment Method

A. Reimbursement in arrears based on:

Itemized Monthly Itemized Quarterly Flat Rate One-time

B. Advanced Payment

C. Other, explain:

Q) Retention

1. Is Agreement subject to retention? No Yes

If Yes, Will retention be released prior to Agreement termination? No Yes

R) 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.

S) Disabled Veteran Business Enterprise Program (DVBE)

1. Exempt (Interagency/Other Government Entity)

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2. Meets DVBE Requirements DVBE Amount:\$ _____ DVBE %: _____
 Contractor is Certified DVBE
 Contractor is Subcontracting with a DVBE: _____

3. Contractor selected through CMAS or MSA with no DVBE participation.

4. Requesting DVBE Exemption (attach CEC 95)

T) Miscellaneous Contract Information

1. Will there be Work Authorizations? No Yes
2. Is the Contractor providing confidential information? No Yes
3. Is the Contractor going to purchase equipment? No Yes
4. Check frequency of progress reports
 Monthly Quarterly _____

5. Will a final report be required? No Yes
6. Is the agreement, with amendments, longer than a year? If yes, why? No 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.

U) The following items should be attached to this CRF (as applicable)

1. Exhibit A, Scope of Work	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<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. CEQA Documentation	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached
7. Resumes	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
8. CEC 105, Questionnaire for Identifying Conflicts		<input checked="" type="checkbox"/> Attached

Agreement Manager Date Office Manager Date Deputy Director Date

**Exhibit A
SCOPE OF WORK**

TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2		Research Flights and Data Assimilation
3		Reconciliation of LES & Flight Data
4		Technology Transfer

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Conley		
2			PG&E
3			
4			

GLOSSARY

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

Acronym	Definition
AGL	Above Ground Level (reference to altitude)
CO ₂	Carbon Dioxide
CPR	Critical Project Review
CRDS	Cavity Ring-down spectroscopy
Energy Commission	California Energy Commission
LES	Large Eddy Simulation
MSA	Minimum Safe Altitude
PAC	Project Advisory Committee
PIER	Public Interest Energy Research
PG&E	Pacific Gas & Electric
PRCI	Pipeline Research Council International
PSI	Pounds per square inch

Problem Statement

Early detection of leaks from natural gas transmission pipelines is critical for many reasons, including:

1. California utility companies purchase gas, most of it from out-of-state. When some fraction of that gas is lost due to leakage, revenue is lost along with it. This leads to higher gas rates passed on to the customer.
2. Natural gas (predominantly methane) is a potent greenhouse gas, with a global-warming potential 72 times that of carbon dioxide (CO₂) on a per mass basis if the climate effects are measured in a 20 year timeframe. Thus, unburned methane escaping to the atmosphere will contribute significantly to climate change.
3. Public safety is compromised in the immediate area around the leak where the methane concentration exceeds the lower explosive limit (5%). Byproducts of the natural oxidation of methane in the atmosphere include the air pollutants ozone and carbon monoxide.

Several technologies currently exist for leak identification. Those that have proven effective operate onboard helicopters at low altitude and great expense. The contractor received a grant from Pipeline Research Council International (PRCI) in January of 2012 for what was essentially a “proof-of-concept” project to determine if leaks could be detected from aircraft using onboard cavity ring down methane analyzers. The first phase of the project (January-June 2012) involved building a system for the airplane that could collect data from the onboard analyzer and combine it with meteorological data from the airplane to predict the location of a leak given a sudden increase in atmospheric methane . This is the only project working on leak localization from fixed-wing aircraft using fast-response trace gas detection.

Several challenges complicate aerial leak detection, including.

1. Flight safety normally dictates a minimum safe altitude (MSA) of 500 feet above ground level (AGL). Unfortunately, as the plume escapes the high-pressure pipeline, the gas cools adiabatically, rendering the gas denser than the surrounding air and inhibiting vertical transport. As the gas is carried downwind and warmed by the ground it mixes with the surrounding air and eventually begins to rise (lofted by turbulent motion). By the time the plume reaches 500 feet, it has dispersed to the point where it can be difficult to identify. Methane enhancements of 10-30 ppb on a background of 1850 ppb are common for moderate sized leaks (100-500 scf/hr). In the right panel displays two lines, the actual pipeline (red) and the predicted optimal path (yellow). The yellow path is calculated using the measured winds from the airplane and the parameterized atmospheric mixing.

2. The plume does not fill the atmospheric boundary layer uniformly. Rather it meanders as it is carried by updrafts and downdrafts while drifting with the mean wind. Because of this fact, there is no guarantee that on any given pass, the aircraft will actually pass through the plume. Instead, we attempt to quantify a statistical likelihood that after a given number of passes, a negative indication can be interpreted as the absence of leaks.
3. During the May test around Sacramento, the background methane variability was in the range of 30-50 ppb. For the time series given, an enhancement of 30 ppb would be difficult to distinguish from rapid changes in the background. This suggests the use of a new tracer to identify natural gas leaks unambiguously.

Goals of the Agreement

The goal of this Agreement is to provide California utilities a cost-effective technology for detecting leaks in natural gas transmission lines. The contractor also hopes that progress can be made toward estimating the size of pipeline leaks, thereby allowing a quantification of the total pipeline emissions from transmission line leaks. Since leak detection from ground vehicles uses the same software as the aircraft, this agreement is also expected to result in substantial improvements to the ground vehicle detection system.

Objectives of the Agreement

The objectives of this Agreement are to:

- Conduct flights over known leaks to determine the probability of detection for a single pass and estimate the number of passes required for any given confidence level.
- Identify atmospheric conditions suitable for surveys using this technology and the impact of flying in other meteorological conditions.
- Build a large database of measurements from flights over sources of known magnitude under known meteorological conditions to better understand the generalized dispersion of natural gas leakage plumes.
- Determine if the magnitude of a detected leak can be reliably estimated from the sampled characteristics of the plume(s).

REFERENCES

Weil, J. C., Sullivan, P. P., Patton, E. G., & Moeng, C.-H. (2012). Statistical Variability of Dispersion in the Convective Boundary Layer: Ensembles of Simulations and Observations. *Boundary-Layer Meteorology*, 145(1), 185-210. doi: 10.1007/s10546-012-9704-y

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:

- Terms and conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

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)

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

Contractor Deliverables:

- An Updated Schedule of Deliverables
- An Updated Gantt Chart (if included)
- An Updated List of Match Funds
- An Updated List of Permits

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 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

- 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

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Contractor shall:

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

This meeting will be attended by, at a minimum, the 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 present 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
- Prepare 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

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

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 done under this Agreement. The Commission Contract Manager will review and approve the Final 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.

Deliverables:

- Draft Final Report
- Final Report

MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT

Task 1.7 Identify and Obtain Matching Funds

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

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. 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 Commission Contract Manager 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.
- 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 Commission Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Contract Manager 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

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 Commission Contract Manager 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.
- 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 Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Contract Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Contract Manager 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 Commission Contract Manager 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)

PAC

Task 1.10 Establish the PAC

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

The PAC should be composed of diverse professionals. The number can vary depending on potential interest and time availability. The exact composition of the PAC may change as the need warrants. PAC members serve at the discretion of the Commission Contract Manager.

The PAC 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 PAC 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.

The Contractor shall:

- Prepare a draft list of potential PAC members that includes name, company, physical and electronic address, and phone number and submit it to the Commission Contract Manager 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 PAC meeting will be developed.
- Recruit PAC 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 PAC members.
- Submit letters of acceptance or other comparable documentation of commitment for each PAC member.

Deliverables:

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

Task 1.11 Conduct PAC Meetings

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

The Contractor shall:

- Discuss the PAC meeting schedule at the kick-off meeting. The number of face-to-face meetings and teleconferences and the location of PAC meetings shall be determined in consultation with the Commission Contract Manager. This draft schedule shall be presented to the PAC members during recruiting and finalized at the first PAC meeting.
- Organize and lead PAC meetings in accordance with the schedule. Changes to the schedule must be pre-approved in writing by the Commission Contract Manager.
- Prepare PAC meeting agenda(s) with back-up materials for agenda items.

- Prepare PAC meeting summaries, including recommended resolution of major PAC issues.

Deliverables:

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

TECHNICAL TASKS

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.5. Deliverables not requiring a draft version are indicated by marking “(no draft)” after the deliverable name.

Task 2 (Research Flights and Data Assimilation)

The goal of this task is to collect flight data around known leaks. The Contractor will conduct 120 hours of flights over known leaks/releases in an effort to map the dispersion of the natural gas upon leaving the high-pressure line. Flights will be conducted before and after the Large Eddy Simulation (LES) results are implemented.

The Contractor shall:

- Prepare a Test Plan for each airplane deployment
- Perform 120 hours of instrumented flights
- Collect GPS, wind, temperature, humidity, methane and ethane data during each flight. Create a Flight Data File that contains the flight data.
- Prepare a technical memorandum entitled “Test Results” summarizing results of research flights
- Build a 3D picture of actual plume dispersion from leak. Create a Plume Dispersion Picture File that contains the 3D picture.
- Correlate dispersion with varying meteorological and surface conditions
- Evaluate performance of current algorithm and calculate probability of intercept for single pass
- Prepare a technical memorandum entitled “Dispersion Analysis” which analyzes dispersion and compares observed dispersion with existing dispersion parameterizations

Deliverables:

- Test Plan
- Flight Data File
- “Test Results” technical memorandum (no draft)
- “Dispersion Analysis” technical memorandum (no draft)
- Plume Dispersion Picture File

Task 3 (Reconciliation of LES and Flight Data)

The goal of this task is to use LES to improve the prediction of the optimal downwind distance for plume intercept. LES runs will be performed for conditions similar to that experienced during the field tests and the predicted plume locations will be compared with the actual locations determined during the test flights.

The Contractor shall:

- Run simulations of ground-level, heavier-than-air releases and determine the dimensionless downwind distance where the plume crosses the minimum safe altitude (MSA) of 150 meters
- Determine minimum and maximum wind speeds where the plume can be expected to cross the MSA with a minimum enhancement of 10% of background.
- Analyze flight data to identify possible improvements in the airborne positioning algorithm
- Create a Spreadsheet of LES Results that shows plume rise versus dimensionless downwind distance
- Determine number of passes required to assure leak detection with a given level of confidence
- Prepare a technical memorandum entitled “Algorithm Improvements” that includes the optimal intercept algorithm and shows the spread in data and predicted probability of measuring sufficient enhancement on a given pass

Deliverables:

- Spreadsheet of LES Results
- “Algorithm Improvements” technical memorandum (no draft)

Task 4 (Technology Transfer)

Demonstrate the use of the airborne system to key decision-makers. Provide instructions to outfit airplanes with instrumentation to allow survey flights using this technology.

The Contractor shall:

- Prepare a Technology Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public. The level of detail expected is least for research-related projects and highest for demonstration projects. Key elements from this report shall be included in the Final Report for this project.

- Conduct technology transfer activities in accordance with the Technology Transfer Plan. These activities shall be reported in the Monthly Progress Reports.

Deliverables:

- Technology Transfer Plan

STATE OF CALIFORNIA
STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: The Regents of the University of California, on behalf of the Davis Campus

WHEREAS The Regents of the University of California, on behalf of the Davis Campus seek to enter into Contract Number 500-13-005 with the State Energy Resources Conservation and Development Commission (Energy Commission) in the amount of **\$300,000**;

WHEREAS the purpose of the Contract is to improve an airborne system that detects leaks from natural gas transmission pipelines;

WHEREAS the Energy Commission has reviewed the project for compliance with the California Environmental Quality Act and found that it is exempt as specified in Form CEC-94 for Contract Number 500-13-005;

THEREFORE BE IT RESOLVED, that the State Energy Resources Conservation and Development Commission (Energy Commission) approves Contract number 500-13-005 with **The Regents of the University of California, on behalf of the Davis Campus** in the amount of **\$300,000**.

FURTHER BE IT RESOLVED, that this document authorizes the Executive Director to execute the same on behalf of the Energy Commission.

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on February 18, 2014.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Harriet Kallemeyn,
Secretariat