

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION

New Agreement PIR-15-003 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Yu Hou	43	916-327-1544

Recipient's Legal Name	Federal ID Number
Institute of Gas Technology dba Gas Technology Institute	36-2170137

Title of Project
Assessment of Fugitive Emissions from the Natural Gas System-Commercial Buildings

Term and Amount	Start Date	End Date	Amount
	1/4/2016	3/29/2019	\$ 599,891

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

Proposed Business Meeting Date	11/12/2015	<input checked="" type="checkbox"/> Consent	<input type="checkbox"/> Discussion
Business Meeting Presenter	Yu Hou	Time Needed:	5 minutes

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

Agenda Item Subject and Description

INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE. Proposed resolution approving agreement PIR-15-003 with Institute of Gas Technology dba Gas Technology Institute (GTI) for a \$599,891 grant to conduct and analyze measurements of fugitive methane leaks/emissions from commercial buildings in northern and southern California.

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 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.

The project is exempt under class 6 because the project activities include conduct emission measurement experiment, methane emission data collection, data analysis and computer simulations. None of the activities are expect to directly change the physical environment.

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

Check all that apply

- | | |
|---|---|
| <input type="checkbox"/> Initial Study | <input type="checkbox"/> Environmental Impact Report |
| <input type="checkbox"/> Negative Declaration | <input type="checkbox"/> Statement of Overriding Considerations |
| <input type="checkbox"/> Mitigated Negative Declaration | |

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

Legal Company Name:	Budget
DOE- Lawrence Berkeley National Laboratory	\$ 175,000
	\$
	\$
	\$
	\$

GRANT REQUEST FORM (GRF)



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

Legal Company Name:

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	14-15	501.0011	\$599,891
			\$
			\$
			\$
			\$
			\$
R&D Program Area: EGRO: EA		TOTAL:	\$599,891
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer		Recipient's Project Manager	
Name:	Kate Jauridez	Name:	Larry Brand
Address:	1700 S MT PROSPECT RD	Address:	1105 KENNEDY PL STE 5
City, State, Zip:	DES PLAINES, IL 60018-1804	City, State, Zip:	DAVIS, CA 95616-1272
Phone:	847-768-0905 / Fax: - -	Phone:	530 758 2392 / Fax: - -
E-Mail:	Kate.Jauridez@gastechnology.org	E-Mail:	Larry.Brand@Gastechnology.org

Selection Process Used

Competitive Solicitation Solicitation #: PON-14-507

First Come First Served Solicitation

The following items should be attached to this GRF

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

_____ Agreement Manager _____ Date _____ Office Manager _____ Date _____ Deputy Director _____ Date

EXHIBIT A
Scope of Work
Gas Technology Institute

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Site Selection
3		Measurement Technology Selection
4	X	Field Measurements
5		Probability of Component/Building Emission Levels with Confidence Limits
6		Develop Probability Distribution for Average Emission Levels from Each Component
7		Monte Carlo Analysis
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
GHG	Greenhouse Gas
IOU	Investor Owned Utilities
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 to fund the development and validation of a field method to plan, conduct, and analyze measurements of fugitive methane leaks/emissions from commercial buildings in northern and southern California.

B. Problem/ Solution Statement

Problem

California's commitment to reducing methane emissions is demonstrated by the emission reduction requirements mandated by AB32, which specifically includes reducing fugitive methane emissions from the natural gas system. Any reduction in emissions requires an understanding of the baseline emissions for a given system and the proper methods and measurement techniques to validate any reduction in the emissions. California has initiated efforts for quantifying emissions for various sources of emissions such as natural gas pipelines;

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

Gas Technology Institute

however, it has been recognized that emissions from other sources such as commercial buildings have not been well characterized. This project is essential to providing the necessary information to measure and quantify methane emissions from commercial buildings.

The primary goal of this project is to conduct a survey of post-metering methane emissions from commercial structures. Obtaining information on the post-metering leakage is needed to gain a holistic picture of the total leakage from the natural gas industry. Additional data, measurement, and reporting tools can improve the characterization of fugitive methane emissions from natural gas supplies to California.

Solution

This project will develop and validate a field method to plan, conduct, and analyze measurements of fugitive methane leaks/emissions from commercial buildings in northern and southern California. The method will measure post-metering methane leakage from specific appliances or system components, as well as quantify total building emissions. This project is designed to ensure a representative sample of building types and consider factors such as construction year, geographical distribution, and services provided. The proposed effort is a small scale field measurement program with the goal of conducting a larger program in the future.

The field data and statistical analysis will be used as input into a Monte Carlo simulation. Ensuring the field data collected is a proper random sampling of use cases across the state of California will allow the Monte Carlo simulation output to be used for scenario analysis to estimate expected emissions reduction from future regulations.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Develop methods for quantifying post-metering methane emissions from commercial buildings based on prior art and captive building testing
- Collect field data from at least 40 commercial buildings or a lesser number as approved in writing by the CAM.
- Use field data and statistical techniques to determine the validity of the measurements, their implications to the building types, and the scale of testing required for a more comprehensive study

Ratepayer Benefits: This Agreement will result in the ratepayer benefits of lower energy costs and increased safety for building occupants. Commercial building ratepayers largely purchase natural gas from third party suppliers but continue to pay a customer charge and distribution charge to the investor Owned Utilities (IOUs) in return for reliable service and the expertise that the utility provides if there is a safety event. Since costs are related to volume through the distribution charge, addressing fugitive methane emissions would reduce the volume of natural gas moved through the distribution system and reduce the cost to the ratepayer. In addition, the fugitive emissions are largely post-meter emissions of natural gas that has already been purchased, so the building owner benefits from purchasing less natural gas.

Safety is the number one priority among natural gas IOUs. Detectable gas leaks in buildings generate a quick response from the gas utility and public safety personnel. Fugitive emissions

EXHIBIT A

Scope of Work

Gas Technology Institute

are below detection limits, by definition, but if a pattern of leaks is found, workforce training may be improved to reduce leaks overall and improve safety. Following improved workforce training with stronger commercial building commissioning practices will assure an overall reduction in natural gas emissions and their contribution to greenhouse gas (GHG) emissions.

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 developing and validating a framework to measure and quantify methane emissions from commercial buildings. To meet the state's goal to reduce GHG emissions, the state's baseline emissions must be quantified. For methane emissions from the natural gas industry, the state has commissioned studies focused on quantifying emissions up to the customer meter. This is the first study to focus on emissions post meter specifically from commercial buildings. Therefore methods specific to measuring emissions at a component level, as well as utilizing integrated methane emission measurements, will need to be developed as there is no existing standard method. Being able to quantify emissions from these sources will allow for characterization of emission profiles and targeting of sources with the largest potential for emissions reduction to help meet the state's goal to reduce emissions.

Agreement Objectives

The objectives of this Agreement are to:

- Develop a methodology to measure emissions from commercial buildings
- Validate the methodology in a pilot study
- Collect field data from a representative sample set of commercial buildings
- Calculate probability emission levels by component sources
- Develop probability distribution for average emission levels by component category and building category
- Perform Monte Carlo simulation output to be used for scenario analysis to estimate expected emissions reduction from future regulations

EXHIBIT A

Scope of Work

Gas Technology Institute

I. 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.

EXHIBIT A

Scope of Work

Gas Technology Institute

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
 - Text documents will be in MS Word file format, version 2007 or later.
 - Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
 - Project management documents will be in Microsoft Project file format, version 2007 or later.
- **Software Application Development**
- Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
 - Microsoft Internet Information Services (IIS), (version 6 and up). Recommend 7.5.
 - Visual Studio.NET (version 2008 and up). Recommend 2010.
 - C# Programming Language with Presentation (UI), Business Object and Data Layers.
 - SQL (Structured Query Language).
 - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
 - Microsoft SQL Reporting Services. Recommend 2008 R2.
 - XML (external interfaces).

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

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.

EXHIBIT A

Scope of Work

Gas Technology Institute

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

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

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

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

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

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

EXHIBIT A

Scope of Work

Gas Technology Institute

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.

EXHIBIT A

Scope of Work

Gas Technology Institute

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.

EXHIBIT A

Scope of Work

Gas Technology Institute

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
- Acceptance 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:
 - 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)

EXHIBIT A

Scope of Work

Gas Technology Institute

- Ensure that the document is written in the third person.
 - 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's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
 - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
 - Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
 - 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 with 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.

EXHIBIT A

Scope of Work

Gas Technology Institute

The Recipient shall:

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

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

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

EXHIBIT A

Scope of Work

Gas Technology Institute

- 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*)

EXHIBIT A

Scope of Work

Gas Technology Institute

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. 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.

EXHIBIT A
Scope of Work
Gas Technology Institute

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

EXHIBIT A

Scope of Work

Gas Technology Institute

III. TECHNICAL TASKS

TASK 2 SITE SELECTION

The goals of this task are to (1) define the commercial sites to conduct field sampling, select a representative set of sites in both northern and southern California with team site access and then randomly select and take measurements; and (2) execute any agreements necessary to secure the sites. The measurements will be conducted in task 4.

The Recipient shall:

- Determine the site characteristics that will define the sampling design.
- Determine the number of sites in northern and southern California and report to CAM for approval.
- Select sites in northern and southern California.
- Coordinate with the California gas utilities to help gain access to the selected sites.
- Reach agreement with the managers of the selected sites regarding the project timeline, space reserved for the project, equipment installation, and indemnity.
- Prepare and provide the *Sampling Methodology Report* that describe the sampling method selected and justification.

Products:

- Sampling Methodology Report (Draft and Final)

TASK 3 MEASUREMENT TECHNOLOGY SELECTION

The goal of this task is to develop and demonstrate methods to measure methane leakage from commercial building infrastructure at scales of (1) individual components (e.g. cooking ranges, water heaters) and (2) integrative measurements of total emissions from specific areas with concentrated numbers of natural gas equipment (e.g. kitchen, water heater room)in commercial buildings.

The Recipient shall:

- Develop and demonstrate a high precision gas sampling and analysis method to quantitatively measure methane leaks from localized leakage in commercial natural gas infrastructure.
- Extend existing Lawrence Berkeley National Laboratory capability for methane leakage measurements from residential buildings to demonstrate an integrative measurement for room or building scale gas leakage measurements.
- Prepare and provide *Measurement Procedure and Training Materials* and train Gas Technology Institute (GTI) staff on component-level and whole-room measurement methods.
- Prepare and provide *Methane Emission Measurement Methods in Commercial Building Report* that describe the measurement methods and justification.

Products:

- Measurement Procedure and Training Materials
- Methane Emission Measurement Methods in Commercial Building Report (Draft and Final)

EXHIBIT A

Scope of Work

Gas Technology Institute

TASK 4 FIELD MEASUREMENTS

The goal of this task is to conduct field measurements on methane emissions from the commercial buildings that have been pre-determined in Task 2. Measurements will be made at the component and building levels as described in task 3.

The Recipient shall:

- Collect field data on methane emission measurements from at least 40 commercial buildings or a lesser number as approved in writing by the CAM from the two largest commercial building types by gas use, restaurant and health.
- Document the field data collection.
- Prepare and provide a *Field Measurement Summary Report* of the field data measurements.
- Participate in CPR as described in TASK 1. 3 as well as prepare and provide a *CRP Report*.

Products:

- Field Measurement Summary Report (Draft and final)
- CPR Report

TASK 5 PROBABILITY OF COMPONENT/BUILDING EMISSION LEVELS WITH CONFIDENCE LIMITS

The goal of this task is to ascertain the proportion of the commercial buildings and appliances in the California population, in a particular category, with a certain leakage or emission level.

The Recipient shall:

- Conduct Bayesian statistical analysis on the field data collected.
- Categorize the emission sources at the appliance and building level into groups by type and severity.
- Prepare and provide a *Field Data Analysis Report* that includes the ordinal ranking with Bayesian credibility levels of the highest to lowest emitting component sources or appliances and the likelihood the newly identified or installed components would emit at these various levels.

Products:

- Field Data Analysis Report (Draft and Final)

TASK 6 DEVELOP PROBABILITY DISTRIBUTION FOR AVERAGE EMISSION LEVELS FROM EACH COMPONENT

The goal of this task is to develop the probability distribution plots for the average emission levels by component category and building type in the California population.

The Recipient shall:

- Perform bootstrap with replacement non-parametric analysis on the field data collected in Task 4.

EXHIBIT A

Scope of Work

Gas Technology Institute

- Prepare and provide *Component Level Data Analysis Report* that includes a set of fugitive methane emission probability distributions for the components and buildings measured.

Products:

- Component Level Data Analysis Report (Draft and final)

TASK 7 MONTE CARLO ANALYSIS

The goal of this task is to calculate fugitive methane emissions inventories from commercial buildings and their appliances and system components at a regional and state level.

The Recipient shall:

- Perform Monte Carlo simulation using the TASK 5 probability of component/building emission levels with confidence limits and the TASK 6 probability distributions for average emission levels from each component as inputs to the analysis.
- Prepare and provide *Simulation Results and Analysis Report* that includes the inventory of methane emissions for the bound set of emitters selected in the project. This will provide the “status quo” inventories for typical commercial building and component mixes as they stand today, using current buildings and components and regulations.

Products:

- Simulation Results and Analysis Report (Draft and Final)

TASK 8 EVALUATION OF PROJECT BENEFITS (*Mandatory task*)

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:
 - For Product Development Projects and Project Demonstrations:
 - Published documents, including date, title, and periodical name.
 - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
 - Greenhouse gas and criteria emissions reductions.
 - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.

EXHIBIT A

Scope of Work

Gas Technology Institute

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

EXHIBIT A

Scope of Work

Gas Technology Institute

TASK 9 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES (*Mandatory task*)

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

Products:

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

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: WITH INSTITUTE OF GAS TECHNOLOGY DBA GAS
TECHNOLOGY INSTITUTE (GTI)

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-15-003 from PON-14-507 with Institute of Gas Technology dba Gas Technology Institute (GTI) for a \$599,891 grant to fund the development and validation of a field method to measure and analyze fugitive methane leaks/emissions from commercial buildings in northern and southern California; 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 November 12, 2015.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Tiffani Winter,
Secretariat