STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13) CALIFORNIA ENERGY COMMISSION

New Agreement PIR-14-004 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Matthew Fung	51	916-327-1422

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

Title of Project
Demonstration of a Novel Ultra-Low NOx Boiler for Commercial Buildings

Term and Amount	Start Date	End Date	Amount
	11/1/2014	3/31/2018	$ 798,788

Business Meeting Information

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

Proposed Business Meeting Date	9/10/2014	☐ Consent	☒ Discussion
Business Meeting Presenter	Matthew Fung	Time Needed:	5 minutes

Please select one list serve. Select

Agenda Item Subject and Description

INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE. Proposed resolution approving Agreement PIR-14-004 with the Institute of Gas Technology dba Gas Technology Institute for a $798,788 grant to demonstrate a new ultra-low NOx, dynamically-staged entrainment boiler. The length of this agreement is 24 months. Contact: Matthew Fung (5 minutes)

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 15301
   - ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

   Explain reason why Agreement is exempt under the above section:
   The project involves replacement of an existing commercial boiler with a low-NOx commercial boiler.

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

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

Legal Company Name:	Budget
Tetra Tech, Inc.	$ 647,901
Almega Environmental	$ 14,000

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	13-14	501.001H	$798,788
			$
			$
R&D Program Area: EERO: Buildings		TOTAL:	$798,788
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 02/13) CALIFORNIA ENERGY COMMISSION

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	Fred Vitalo			Name:	Derek Wissmiller		
Address:	1700 S MT PROSPECT RD			Address:	1700 S MT PROSPECT RD		
City, State, Zip:	DES PLAINES, IL 60018-1804			City, State, Zip:	DES PLAINES, IL 60018-1804		
Phone:	847-768-0761 /	Fax:	- -	Phone:	847-768-0877 /	Fax:	- -
E-Mail:	fred.vitalo@gastechnology.org			E-Mail:	derek.wissmiller@gastechnology.org		

Selection Process Used

☒ Competitive Solicitation Solicitation #: PON-13-503

☐ First Come First Served Solicitation

The following items should be attached to this GRF

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

Agreement Manager	Date	Office Manager	Date	Deputy Director	Date

Exhibit A
SCOPE OF WORK
PIR-14-004, Gas Technology Institute

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		Project Administration
2		Contract Execution
3		Demonstration Test Plan
4	X	System Design, Fabrication, and Procurement
5		Laboratory Validation
6		Demonstration Site Engineering and Preparation
7	X	Demonstration Site Installation and Commissioning
8		Performance Monitoring, Evaluation, and Reporting
9		Evaluation of Project Benefits
10		Technology/Knowledge Transfer Activities
11		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CO	Carbon Monoxide
CPR	Critical Project Review
DSE	Dynamic Staged Entrainment
Energy Commission	California Energy Commission
FGR	Flue Gas Recirculation
GTI	Gas Technology Institute
HEA	High Excess Air
M&V	Measurement and Verification
NOx	Nitrogen Oxides
SCR	Selective Catalytic Reduction
TAC	Technical Advisory Committee
ULN	Ultra-Low NOx
vppm	Volumetric Parts Per Million

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

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a demonstration of a novel Ultra-Low NOx (ULN) commercial firetube boiler technology.

B. PROBLEM/ SOLUTION STATEMENT

Problem:

Emissions of Nitrogen Oxides (NOx) from combustion sources are a leading cause of air quality degradation, posing serious environmental and health risks. As a result, this criteria pollutant is heavily regulated on the basis of source specific standards. For example, in Southern California, commercial boilers are required to emit less than 9 volumetric parts per million (vppm) NOx[2]. Currently, the only commercially available technologies capable of meeting these emissions are exhaust cleanup systems, such as Selective Catalytic Reduction (SCR), or burner enhancements such as external Flue Gas Recirculation (FGR) and/or High Excess Air (HEA) firing. All of these options incur significant efficiency, operating cost, and/or capital cost penalties in comparison to conventional firetube boiler systems. These penalties can represent a significant economic burden to California-based commercial boiler operators.

Solution:

The Recipient will demonstrate a novel ULN commercial boiler technology, termed Dynamic Staged Entrainment (DSE) boiler, capable of achieving NOx emissions below 9 vppm without the use of SCR, FGR, or HEA. The DSE technology has been developed by Gas Technology Institute (GTI) in cooperation with Power Flame Inc., a major US burner manufacturer, for use in commercial firetube and watertube boiler applications. The demonstration effort proposed here will allow GTI and Power Flame Inc. to effectively transition the technology towards a commercial product to be offered to California customers through Power Flame's California sales distribution representative, California Boiler, Inc. Following successful demonstration and validation of the DSE boiler system, Power Flame Inc. and California Boiler Inc. are positioned to deploy this breakthrough technology throughout the California commercial boiler segment, ultimately reducing end-user costs and energy consumption.

[2] All emissions values discussed here are presented as a dry, volumetric basis, corrected to a 3% oxygen level, as is common for discussion of boiler performance.

C. GOALS AND OBJECTIVES OF THE AGREEMENT

Agreement Goals:
The goals of this Agreement are to:

- Identify and overcome the operational and technical hurdles that may arise during a field-demonstration of the DSE technology; providing valuable insights which will guide decisions as the project team moves towards impending commercialization efforts
- Prove, via independent third-party Monitoring and Verification (M&V), the ability of the system to achieve the stated performance objectives, while operating under real-world conditions at an end-user facility
- Validate the ability of the system to maintain robust and reliable operation throughout an extended performance monitoring period
- Demonstrate the benefits of the DSE technology in terms of providing increased efficiency, reduced gas consumption, and reduced capital/operating costs
- Disseminate the findings of this demonstration project and provide technology transfer to commercial markets in California to increase public awareness and adoption of the DSE technology, and ultimately reduce natural gas consumption
- Facilitate efforts to transition the DSE technology to a commercial product offering to be deployed in the California commercial boiler market segment

Agreement Objectives:
The objectives of this Agreement are to:

- Provide reliable steam production to satisfy building load demands
- Achieve emissions levels less than 9 vppm and 60 vppm for NOx and Carbon Monoxide (CO), respectively, corrected to 3% oxygen, without employing SCR, FGR, or HEA
- Prove the ability of the system to operate with relatively low excess air levels.
- Achieve sufficient operational turndown to match variations in building steam demands
- Comply with local air quality management regulations, attain required permits for operation and construction, and pass emissions source testing

III. TASK 1 PROJECT ADMINISTRATION

PRODUCTS

Subtask 1.1 Products
The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the

"Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version

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

For products that require a final version only

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

For all products

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

      The following describes the accepted formats for electronic data and documents provided to the Energy Commission as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
        - Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
        - Text documents will be in MS Word file format, version 2007 or later.

- Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting
The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

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

  The administrative portion of the meeting will include discussion of the following:
  - 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 place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

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

The CAM shall:

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

Recipient Products:

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

CAM Products:

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

Subtask 1.4 Final Meeting
The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.
  The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.
  - The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
  - The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
    - Disposition of any state-owned equipment.
    - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
    - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.

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

Products:

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

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

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:
- Final Report Outline (draft and final)

CAM Product:
- Style Manual

Subtask 1.6.2 Final Report
The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Products:
- Final Report (draft and final)

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds
The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

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

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

  If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.

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

- A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.

- 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.

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed.

If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

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

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

- Provide guidance in research direction. The guidance may include research scope and methodologies, timing, and coordination with other research. 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 research (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 project research 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 research 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.

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

Subtask 1.11 TAC Meetings
The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

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

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

IV. TECHNICAL TASKS

TASK 2 Contract Execution

The goals of this task are to: (1) confirm the availability of the project demonstration site and a M&V contractor; and (2) execute any agreements necessary to secure the demonstration site and M&V contractor.

Subtask 2.1 Execute a Contract with the Selected Demonstration Site

The Recipient shall:

- Reach agreement with the manager(s) of the selected demonstration site regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, indemnity, and the Recipient's use of any removal or support staff.
  - Select a new site with assistance from the CAM, if the original selected demonstration site becomes unavailable during the project term.
  - Execute a Contract with the Demonstration Site that confirms the agreement reached above on the Recipient's use of the site.

Products:

- Contract with the Demonstration Site

Subtask 2.2 Execute a Contract with the Selected M&V Contractor

The Recipient shall:

- Execute a Contract with the M&V Contractor that secures the contractor's services during the project term and confirms the contractor will follow M&V protocol and prepare the detailed analytical report.
  - Confirm the selected M&V contractor's ability to provide required hardware, software, and staff to conduct the required measurements during the project term.
  - Confirm the selected M&V contractor will follow utility M&V protocols, and will prepare a detailed analytical report to verify energy consumption and engineering calculations for energy and cost savings.
  - Select a new M&V contractor with assistance from the CAM, if the original selected M&V contractor becomes unavailable during the project term.

Products:

- Contract with the M&V Contractor

TASK 3 Demonstration Test Plan
The goal of this task is to prepare a detailed test plan to allow for field evaluation of the DSE system performance relative the demonstration performance objectives.

The Recipient shall:

- Prepare a detailed Draft Demonstration Test Plan consisting of, but not limited to: 1) drivers for the demonstration, 2) performance objectives, 3) the rationale for selection of the test conditions, 4) predicted technology performance based on the results of previous development work, 5) a test matrix showing the number of test conditions and replicated runs, 6) a description of the facilities, equipment, and instrumentation required for the system evaluation, 7) a description of the test procedures, 8) a description of the data analysis procedures, and 9) aspects of the M&V to be fulfilled by the independent third-party M&V contractor.
- Evaluate plan with the project team for appropriateness of instruments, parameters, operating conditions, duration of measurements, and procedures planned for comparing technical and economic performance.
- Prepare Final Demonstration Test Plan.

Products:

- Demonstration Test Plan (draft and final)

TASK 4 System Design, Fabrication, and Procurement
The goal of this task is to design the DSE boiler system in accordance with the demonstration host site needs and fabricate/procure the necessary major equipment.

The Recipient shall:

- Provide a notification letter regarding the release of the major equipment (boiler, burner, controls) for fabrication and procurement. The letter will include, but not be limited to, documentation that the major equipment components have been appropriately designed and sized for the demonstration facility.
- Provide the design specifications of the second generation prototype DSE burner to enable successful transitioning of the technology from a laboratory test unit to a commercial-grade product.
    - Coordinate with the demonstration host site to finalize building hot water and heating requirements, infrastructure, utility connections, and space constraints in order to appropriately size the DSE boiler system to meet facility needs.
    - Coordinate with California equipment suppliers to specify a boiler manufacturer/model to satisfy the host site needs and integrate with the DSE technology, procure the boiler, and deliver it to GTI's research facilities for laboratory validation testing.

- Design the boiler and burner systems controls approach for the commercial DSE product offering, specify the related equipment (blower, valves, logic controller, etc.), procure the components through California equipment suppliers, and deliver to GTI's research facilities for laboratory validation testing.
- Fabricate the DSE burner through a California vendor and deliver to GTI's research facilities for laboratory validation testing.
- Participate in a CPR meeting and prepare a CPR report as required by Task 1.3.

Products:

- Notification letter regarding release of major equipment for fabrication and procurement
- DSE system major equipment design specifications
- CPR Report

TASK 5 Laboratory Validation

The goal of this task is to validate the performance of the DSE boiler system under well controlled experimental conditions, prior to delivery to the demonstration host site.

The Recipient shall:

- Prepare a draft Laboratory Validation Results Report. The report will include, but is not limited to:
  - Results of the DSE boiler system (boiler, burner, controls, etc.) installation in GTI's research facilities and outfit the unit with appropriate instrumentation
  - Operational testing to prove boiler system functions and controls
  - Performance testing results to validate system performance relative to stated performance objectives for operation
- Prepare a final Laboratory Validation Results Report

Products:

- Laboratory Validation Results Report (draft and final)

TASK 6 Demonstration Site Engineering and Preparation

The goal of this task is to generate the demonstration site engineering package and prepare the host site for installation of the DSE system.

The Recipient shall:

- Generate a draft and final Site Design Package that includes, but not limited to:
  - Installation layout drawings including system integration with existing host facility heating lines, utility connections, existing infrastructure,
  - Bill of materials identifying the ancillary equipment (pumps, valves, etc.) and materials (pipe, fittings, etc.) required for the installation

  - Instrument specifications required under the Demonstration Test Plan and indicate installation locations and procedures in the Site Design Package
  - Coordinate with the host site to identify work activities and resources required to decommission and remove pre-existing boiler(s) and related equipment, and to support installation of the DSE boiler system
- Organize and conduct a teleconference to view the completed Site Design Package.
- Provide a notification letter regarding the release of the Site Design Package for installation. The letter will include, but not be limited to, documentation that the complete site design package has been completed, and will include a copy of the overall layout

Products:

- Site Design Package (draft and final)
- Site Design Package Teleconference Summary
- Notification letter regarding release of Site Design Package

TASK 7 Demonstration Site Installation and Commissioning

The goal of this task is to complete the installation of the DSE boiler system and commission it for continued operation by the demonstration host facility.

The Recipient shall:

- Prepare a DSE System Commissioning Report that include discussions on, but is not limited to:
  - Building applications and permits approvals for the installation of the SC&H system at the host site
  - Bids from California-based installation contractors and establish agreement with a selected contractor capable of fulfilling the installation efforts
  - Site visit and coordination with the installation contractor prior to beginning installation of equipment to review the installation scope of work
  - Ancillary equipment (pumps, valves, etc.) and materials (pipe, fittings, etc.) procurement required for the installation through California-based vendors
  - Instrumentation procurement required under the Demonstration Test Plan through California-based vendors
  - Summary of pre-existing boiler equipment removal and installation of the DSE system and the ancillary equipment required per the installation specifications
  - DSE system commissioning for continued operation by the demonstration host facility, ensuring the primary and ancillary components are operating properly within design specifications
- Prepare a Notification Letter on Installation, which will include, but not be limited to; a summary of the work done in this task and confirmation that the installation has been successfully completed.
- Participate in a CPR meeting and prepare a CPR report as required by Task 1.3.

Products:

- DSE System Commissioning Report
- Notification Letter on Installation
- CPR Report

TASK 8 Performance Monitoring, Evaluation, and Reporting

The goal of this task is to evaluate the system performance of the DSE system over an extended monitoring period at the demonstration host facility, to gather data and information on the system performance.

The Recipient shall:

- Prepare a Field Performance Report to include discussions on, but not limited to, the following:
  - Data gathering and analysis on the DSE system performance as installed at the demonstration host facility over an extended monitoring period in accordance with the Demonstration Test Plan
  - Complete independent third-party testing by the selected M&V contractor in accordance with the M&V plan
  - Comparison between project performance and expectations provided in the proposal to actual project performance and accomplishments
  - Field service and support for the DSE boiler system to ensure satisfactory operation throughout the field demonstration period

Products:

- Field Performance Report (draft and final)

TASK 9 Evaluation of Project Benefits

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

The Recipient shall:

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

Exhibit A
SCOPE OF WORK
PIR-14-004, Gas Technology Institute

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

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

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

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

TASK 10 Technology/Knowledge Transfer Activities
The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:
- Prepare an *Initial Fact Sheet* at start of the project that describes the project research. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses research 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 research 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 research 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.
  - 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)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

TASK 11 Production Readiness Plan

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

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss:
- Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
- Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."
- The estimated cost of production.
- The expected investment threshold needed to launch the commercial product.
- An implementation plan to ramp up to full production.
- The outcome of product development efforts, such as copyrights and license agreements.
- Patent numbers and applications, along with dates and brief descriptions.
- Other areas as determined by the CAM.

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE - Please see the attached Excel spreadsheet.

RESOLUTION NO:

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE

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

RESOLVED, that the Energy Commission approves Agreement PIR-14-004 with **the Institute of Gas Technology dba Gas Technology Institute** for a $798,788 grant to demonstrate a new ultra-low NOx, dynamically-staged entrainment boiler. The length of this agreement is 24 months; 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 September 10, 2014.

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

Harriet Kallemeyn,
Secretariat