STATE OF CALIFORNIA
GRANT REQUEST FORM (GRF)
CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

A) New Agreement # EPC-19-023 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Michael Lozano	51	916-327-1425

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

D) Title of Project
Booster Ejector Enhancement of Compressor Refrigeration Facilites Utilizing Industrial Process Waste Heat

E) Term and Amount

Start Date	End Date	Amount
6/15/2020	3/31/2024	$ 1,621,556

F) Business Meeting Information

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

Proposed Business Meeting Date 5/13/2020 ☐ Consent ☒ Discussion

Business Meeting Presenter Ilia Krupenich Time Needed: 5 minutes

Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description:
INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE. Proposed resolution approving Agreement EPC-19-023 with Institute of Gas Technology dba Gas Technology Institute for a $1,621,556 grant to develop and test a novel heat recovery system which includes a booster ejector enhanced refrigeration system utilizing industrial process waste heat and adopting staff's determination that this action is exempt from CEQA. The technology has the potential to reduce electrical and natural gas consumption of the food processing industry by 20 percent.

G) California Environmental Quality Act (CEQA) Compliance

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

   Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:
   a) ☒ Agreement **IS** exempt.
      ☐ Statutory Exemption. List PRC and/or CCR section number:
      ☒ Categorical Exemption. List CCR section number:
      ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

      Explain reason why Agreement is exempt under the above section: Agreement will not cause direct physical change in the environment or a reasonably

foreseeable indirect physical change in the environment because it falls under categorical exemption 15301(a) existing Facilities since it is an interior alteration to plumbing and electrical systems. The project involves implementing chiller and ejector technologies in an existing food processing plant. Permitting for the project will involve a construction permit from a local authority having jurisdiction, which will be secured by the participating food processing plant. Permitting is to be determined.

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

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

Legal Company Name:	**Budget**
Wilson Engineering Technologies	$ 889,070
Tetra Tech Divisions - 100	$ 97,853
Bedrosian & Associates	$ 35,000
	$

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

Legal Company Name:

J) Budget Information

Funding Source	**Funding Year of Appropriation**	**Budget List Number**	**Amount**
EPIC	18-19	301.001F	$1,621,556
			$

R&D Program Area: EERO: IAW TOTAL: $ 1,621,556

Explanation for “Other” selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Isaac Mahderekal

Address: 123 C St

City, State, Zip: Davis, CA 95616-4632

Phone: 530-758-2392 x206

E-Mail: Isaac.Mahderekal@gastechnology.org

2. Recipient's Project Manager

Name: Isaac Mahderekal

Address: 123 C St

City, State, Zip: Davis, CA 95616-4632

Phone: 530-758-2392 x206

E-Mail: Isaac.Mahderekal@gastechnology.org

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-19-304

☐ First Come First Served Solicitation Solicitation #:

M) The following items should be attached to this GRF

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

_____ _____

Agreement Manager **Date**

_____ _____

Office Manager **Date**

_____ _____

Deputy Director **Date**

EXHIBIT A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Product Discovery and Customer Analysis
3	X	Accelerated Laboratory Validation
4	X	Utility Demonstration and Analysis
5		Technology and Knowledge Transfer Activities
6		Production Readiness Plan
7		Evaluation of Project Benefits

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
IoT	Internet of Things
TAC	Technical Advisory Committee
TRL	Technology Readiness Level

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

A. Purpose of Agreement

The purpose of this Agreement is to fund research, development, demonstration, and testing to help natural gas customers safeguard customer-owned gas lines by providing a smart shutoff system. The system will provide additional protection layers during hazardous events and the ability to terminate gas flows. This project will identify safety sensors, integrate these devices into a smart shutoff system, and provide network connectivity to monitor the system status via a web-based interface. Implementation of this technology will decrease the risk of damage posed by a hazardous situation beyond that which is currently attained by manual valves.

B. Problem/ Solution Statement

Problem

Currently, the natural gas infrastructure lacks enhanced safety features to detect and respond to hazardous incidents such as gas leaks, fires, natural disasters, system failures, operational errors, or external impacts. Commercial stand-alone safety devices such as an excess flow valves, or residential natural gas monitors are available, but these devices do not possess "Internet of Things" (IoT) connectivity to automate the safety response among emergency personnel, gas customers, and gas utility companies. Additional research is needed to develop

[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.

an integrated system with smart hazardous detecting sensors, automated shutoff valves, and two-way device-utility communication. Conducting customer research, and validating the performance and safety features of such a system would help establish a smart shutoff technology ecosystem and aid in the adoption of smart shutoff technology. The implication of this would be additional layers of protection to hazardous situations and streamline safety responses.

Solution

The recipient will perform research, development, testing, and demonstration to enhance the resiliency of the natural gas infrastructure by identifying key safety technology advancements, validating these concepts, and demonstrating these technologies in the field. This will benefit the state of California and its ratepayers by reducing the risk of catastrophic damage in the fallout of a hazardous situation, decreasing emissions, and establishing a smart safety shutoff technology system. To accomplish these goals, the project team will conduct a product discovery search to identify emerging advanced safety technologies for residential and commercial customers. The efficacy and reliability of promising technologies will be assessed. Customer research and a survey will also be conducted to understand natural gas customer's smart shutoff knowledge, gather more information on customer requirements, and identify deployment channels for mass adoption of the safety product. New sensing technology will be integrated into the smart shutoff technologies identified in the Product Discovery Report. The recipient will deploy promising smart shutoff systems in a six month pilot trial to validate the performance of the safety valve and sub-system components. With the information obtained from this demonstration, a system dictated by technology and market drivers will be presented to the stakeholders to assist in the continued adoption and coordinated advancement of smart shutoff systems.

A. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Support overcoming one of the largest technology barriers to smart shutoff systems by improving the interoperability and acceptance of safety devices.
- Reduce the threat imposed on the natural gas infrastructure due to the occurrence of hazardous events such as high temperature or natural gas leak detection.
- Enhance the adoption of smart shutoff systems.

Ratepayer Benefits: This Agreement will result in the ratepayer benefits of reduced risk associated with the operation of natural gas pipelines, increased energy delivery reliability, and lowered barriers of smart technology adoption.

Deploying smart shutoff technology to residential and commercial buildings can provide layers of protection to California ratepayers. With smart sensor deployment and automation, ratepayers will have the necessary interventions in place to avoid potentially hazardous events posed by gas leaks, fires, earthquakes, and floods. Detection and intervention capabilities provided by smart safety technology will protect ratepayer life and property. This will also limit pipeline downtime and recovery costs by protecting against damaging incidents, and provide ratepayers access to safe and reliable energy. By establishing the foundation for smart shutoff

requirements, technology developers will have the framework for continued innovation in this emerging market to improve customer satisfaction and lower costs.

Technological Advancement and Breakthroughs: This Agreement will lead to technological advancement and breakthroughs in smart shutoff technology regarding smart sensors, shutoff valves, and software integration to improve safety and prevent natural gas leaks in commercial/residential buildings. Overcoming these barriers will help the State of California achieve its statutory energy goals by preventing natural gas leaks and lowering the emission's footprint of natural gas.

As California transitions to 100% renewable electricity by 2045 and lowers the state's total emissions to 80% below 1990 levels by 2050, flexible access to energy will be needed to meet California's seasonal energy demands. Smart shutoff technology will be required to improve the safety of California's natural gas infrastructure particularly during periods of dormancy, and monitor sources of natural gas emissions at commercial/residential buildings. Currently, deployment of these systems is low due to high costs and limited connectivity. This project aims to provide solutions to the implementation, integration, and communication of advanced safety sensing technologies. These solutions will establish a roadmap that enhances adoption and help maintain the infrastructure's resiliency to respond to customer demand while lowering emissions by shutting-off the flow of gas due to leaks or the detection of a hazardous situation. By advancing the role of smart technologies, California's natural gas infrastructure will be positioned to complement the growing renewable electricity market and assist the state of California in meeting its energy goals.

Agreement Objectives

The objectives of this Agreement are to:

- Develop a product discovery report highlighting new emerging smart shutoff technology trends.
- Perform customer research and survey to gain insights necessary for customer adoption.
- Identify and integrate safety sensors into the smart shutoff technologies identified.
- Validate smart shutoff system performance through various scenario-based tests.
- Conduct pilot demonstrations at a minimum of one residential building and one commercial building for no less than a six month evaluation campaign.
- Develop, test, deploy and improve the smart shutoff system to reach a Technology Readiness Level (TRL) status of 7.
- Provide a system to deploy smart shutoff components with hazard detecting sensors, remote shutoff features, and valve status monitoring.

EXHIBIT A
Scope of Work

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products
The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version

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

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

MEETINGS

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

The Recipient shall:

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

  The <u>administrative portion</u> of the meeting will include discussion of the following:
  - o Terms and conditions of the Agreement;
  - o Administrative products (subtask 1.1);
  - o CPR meetings (subtask 1.3);
  - o Match fund documentation (subtask 1.7);
  - o Permit documentation (subtask 1.8);
  - o Subcontracts (subtask 1.9); and

- 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 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 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 "Payment of Funds" section of 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 five 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. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

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

fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

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

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

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

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

Products:
- Subcontracts (draft if required by the CAM)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)
The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:
- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or

  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. 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

EXHIBIT A
Scope of Work

IV. TECHNICAL TASKS

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

TASK 2 PRODUCT DISCOVERY AND CUSTOMER ANALYSIS

The goals of this task are to: (1) Identify emerging safety technology available to the natural gas industry, (2) Collect information via a customer survey to understand barriers limiting natural gas customers from embracing smart shutoff technology, and (3) Perform initial specification screening of the products.

The Recipient shall:

- Identify emerging technologies and key trends in various international and national natural gas markets for residential and commercial gas customers.
- Prepare *Customer Research Plan* outlining focus group and survey questions.
- Conduct customer research and survey to gain a deeper understanding of customer product knowledge and identify the needs of and deployment strategies in disadvantaged/low-income communities.
- Identify preferred safety features based on customer insight.
- Identify ideal channels that help deliver the smart safety shutoff system to end users.
- Determine and review communication strategy among sensors and safety system.
- Obtain specifications of safety technologies for initial product screening.
- Assess the ability of sensing technology to transmit telemetry data.
- With input from the TAC and the CAM, determine which top performing products will receive continued lab validation testing based on customer outreach and product specification screening.
-
- Summarize the findings of the above activities in a *Product Discovery Report*, including information on how products were evaluated and selected for lab testing.
- Participate in a *CPR meeting* and prepare a *CPR Report #1*.

Products:

- Customer Research Plan (Draft and Final)
- Product Discovery Report (Draft and Final)
- CPR Report #1 (Draft and Final)

TASK 3 SMART SHUTOFF SYSTEM DEVELOPMENT AND LABORATORY VALIDATION TESTING

The smart shutoff system is a hardware and software product comprised of safety sensors, a safety shutoff valve, and software. The goals of this task are to: (1) Integrate smart sensor components to a smart shutoff system, 2) Develop smart shutoff system software, and 3) Validate the smart shutoff system in simulated scenario-based environments.

EXHIBIT A
Scope of Work

Task 3.1 Hardware Integration and Evaluation

The Recipient shall:

- Develop smart shutoff system for laboratory validation tests.
- Integrate safety sensors into the smart shutoff system.
- Monitoring shall include sensors that can measure gas concentration and temperature inside buildings.
- Evaluate and enhance the performance of the smart shutoff system and integrated sub-components to minimize power consumption while maximizing signal strength and data transmission rate. Optimize the balance between performance of the smart shutoff system, power consumption and transmission rate.
- Prepare a *Hardware Design and Specification Report* describing components specification, performance metrics, and non-proprietary smart shutoff system design .
- Perform the necessary experimental tests including, but not limited to varying temperatures and methane concentrations under extreme conditions found from manufacturer specifications to validate sub-system, and safety shutoff valve. Tests can also be done for varying gas pressures and gas flows.
- Perform situational stress tests on smart shutoff system and sensors to monitor valve closure timing, sensor accuracy, and triggering threshold.
- Validate sub-components and smart shutoff system performance during experimentally simulated scenario-based hazardous events.
- Validate system reliability prior to field demonstration.
- Prepare a *Hardware Validation Report* detailing the above validation process and results.
- Participate in a *CPR meeting* and prepare a *CPR Report #2.*

Task 3.2 Software Integration and Evaluation

The Recipient Shall:

- Develop software modules to integrate sensors and shutoff valve to IoT data management platform with permissions so that the smart shutoff valves can be operated safely and securely. Information should be communicated wirelessly between monitoring sensors, shutoff valves, and end users.
- Evaluate and enhance dashboards, data visualization, and communication protocols of IoT data management for end user and gas utility specific needs with access from computer or hand-held device.
- Develop the triggering criterion for automatic shutoff, and test its performance for common hazardous scenarios for residential and commercial buildings.
- Prepare a *Software Design and Specification Report* describing components specification, user interface, IoT connectivity, performance metrics, and non-proprietary smart shutoff system design,
- Prepare *Software Validation Report* detailing the above process and results.

Products (for all of Task 3):

- Hardware Design and Specification Report (Draft and Final)
- Software Design and Specification Report (Draft and Final)
- Hardware Validation Report (Draft and Final)

- Software Validation Report (Software) (Draft and Final)
- CPR Report #2 (Draft and Final)

TASK 4 UTILITY DEMONSTRATION AND ANALYSIS
This task seeks to deploy the smart shutoff systems to at least one residential building and at least one commercial building for no less than a six month evaluation campaign. All demonstration sites must be in a California natural gas investor owned utility service territory.

The Recipient shall:

- Prepare a *Site Readiness Report* to include description of steps made to prepare demonstration sites, letter from site host/owner confirming site availability, and copy of all required permits for sites.
- Prepare a *Field Demonstration Plan* describing the steps, procedures, requirements, and permissions needed for field demonstration activities, laying out strategies for data collection, and identifying success criteria for the field demonstration. *Field Demonstration Plan* should include various use cases so performance can be characterized. Data should be collected and analyzed in real time to determine whether there is a gas leak or fire in a building for notification of the end user and shutoff actuation.
- Install the necessary units at the selected demonstration sites.
- Identify locations inside and outside the buildings where hazardous events are likely to occur, and install sensor components.
- Implement the *Field Demonstration Plan* for a minimum of six (6) months.
- Monitor smart shutoff system performance with on-site if possible, and online check-ins though the online platform.
- Evaluate findings from deployment of smart shutoff systems.
- Evaluate remote software operation and data management.
- Prepare a *Field Demonstration Report* summarizing the results of demonstration and documenting sensor system setup location, and operation during the trial. *Field Demonstration Report* should also include a description of the challenges in installation, low power consumption, cost effectiveness, and smart control of the system.
- Participate in a CPR meeting and prepare a *CPR Report #3*.

Products:

- Site Readiness Report
- Field Demonstration Plan (Draft and Final)
- Field Demonstration Report (Draft and Final)
- CPR Report #3 (Draft and Final)

TASK 5 TECHNOLOGY AND KNOWLEDGE TRANSFER ACTIVITIES
The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the

format provided by the CAM.

- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
  - 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)

TASK 6 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 the following:
  - 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.
- o Patent numbers and applications, along with dates and brief descriptions.
- o Other areas as determined by the CAM.

Products:
- Production Readiness Plan (draft and final)

TASK 7 EVALUATION OF PROJECT BENEFITS
The goal of this task is to report the benefits resulting from this project.

The Recipient shall:
- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
- Published documents, including date, title, and periodical name.
- Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
- Greenhouse gas and criteria emissions reductions.
- Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
- Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- 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.
- Outcome of demonstrations and status of technology.
- Number of similar installations.
- Jobs created/retained as a result of the Agreement.
  - o 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.

  - o 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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 20-0513-9c

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 (CEC) adopts the staff CEQA findings contained in the Agreement or Amendment Request Form (as applicable); and

RESOLVED, that the CEC approves Agreement EPC-19-023 with Institute of Gas Technology dba Gas Technology Institute for a $1,621,556 grant to develop and test a novel heat recovery system which includes a booster ejector enhanced refrigeration system utilizing industrial process waste heat and adopting staff's determination that this action is exempt from CEQA. The technology has the potential to reduce electrical and natural gas consumption of the food processing industry by 20 percent; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her designee shall execute the same on behalf of the CEC.

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 CEC held on May 13, 2020.

AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Cody Goldthrite
Secretariat