

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement PIR-15-011 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Rajesh Kapoor	51	916-327-1388

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

Title of Project
Performance Evaluation of an Industrial Waste Heat Recovery System

Term and Amount	Start Date	End Date	Amount
	6/30/2016	3/31/2020	\$ 500,000

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

Proposed Business Meeting Date	6/14/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Rajesh Kapoor	Time Needed:	5 minutes
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Please select one list serve. NaturalGas (NG Research Program)

Agenda Item Subject and Description

INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE (GTI). Proposed resolution approving agreement PIR-15-011 with the Gas Technology Institute for a \$500,000 grant to conduct a pilot-scale demonstration of a low-cost, low-temperature H2AC waste heat recovery system at an industrial chemical processing site to validate natural gas savings and system performance.

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: Cal. Code Regs., tit 14, § 15301

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

Explain reason why Agreement is exempt under the above section:

The activities funded by the agreement will not cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because the proposed project encompasses equipment replacement at an existing and fully developed industrial site within a highly urban landscape in Southern California. The equipment to be installed is a Rheem H2AC Waste Heat Recovery Roof top Unit. This unit will replace an existing roof top unit and will also include installation of a water storage tank and piping. The proposed project does not involve sensitive lands, agricultural or historical resources, nor will it adversely affect noise, traffic, or wastewater management.

 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

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List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)	
Legal Company Name:	Budget
Davis Energy Group, Inc.	\$ 225,000
TBD Installation Contractor	\$ 37,000
Inspire	\$ 3,000
Rheem Inc.	\$ 52,000 (Match funding)

List all key partners: (attach additional sheets as necessary)	
Legal Company Name:	
Rheem Inc.	

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	14-15	501.0011	\$500,000
			\$
			\$
R&D Program Area: EERO: IAW		TOTAL:	\$500,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	Kate Jauridez			Name:	Hillary Vadnal		
Address:	1700 S Mount Prospect Rd			Address:	1700 S Mount Prospect Rd		
City, State, Zip:	Des Plaines, IL 60018-1804			City, State, Zip:	Des Plaines, IL 60018-1804		
Phone:	847-768-0905 /	Fax:	- -	Phone:	847-768-0500 /	Fax:	- -
E-Mail:	Kate.Jauridez@gastechnology.org			E-Mail:	Hillary.vadnal@gastechnology.org		

Selection Process Used	
<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: GFO-15-505
<input type="checkbox"/> First Come First Served Solicitation	

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

_____ Agreement Manager	_____ Date	_____ Office Manager	_____ Date	_____ Deputy Director	_____ Date
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Exhibit A Scope of Work Template

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1	N/A	General Project Tasks
2		Subcontract Execution
3	X	Site Inspection, Engineering, Installation, and Commissioning
4		Performance Monitoring
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
Energy Commission	California Energy Commission
GTI	Gas Technology Institute
HVAC	Heating, Ventilation, and Air Conditioning
H2AC	Rheem's H ₂ AC™
RTU	Rooftop Unit
TAC	Technical Advisory Committee
WHR	Waste Heat Recovery
M & V	Measurement and Verification

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the validation of industrial natural gas savings through a field demonstration of Rheem's H₂AC™ (H2AC) Waste Heat Recovery (WHR) Rooftop Unit (RTU).

B. Problem/ Solution Statement

Problem

The U.S. Department of Energy has estimated that 20 to 50% of industrial energy use is lost as waste heat. Waste heat recovery has long been an area of intense interest for industrial energy users. The past two decades have seen expansion in the use of economizers and large heat pump WHR systems, which focus on higher temperature waste heat streams and often apply

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

Exhibit A Scope of Work Template

captured waste heat to generate steam, preheat boiler feed water, or apply heat to other process loads. High-temperature WHR is a crowded and well-served market.

Lower temperature waste heat, such as heat extracted from cooling water from machines or condensers, is much more challenging to recapture cost-effectively within industrial applications, therefore far fewer market participants have focused in this area.

High-temperature WHR systems have long been the focus of energy efficiency efforts in the industrial sector. The low-temperature WHR systems offer a far more modest cost savings stream so they are often overlooked. A durable, low-cost, low-temperature WHR system that is applicable to the industrial sector and does not require changes to ancillary equipment or void existing warranties could open up a new avenue for natural gas savings in California.

The H2AC's performance has been well documented at commercial food service sites. Typically the savings have been about 30% of the site's energy consumption for water heating. Generally, an industrial chemical processing site has a significantly higher hot water load, but there is a lack of field data and understanding as to how the H2AC system would perform in this scenario. Without third-party verified data of the system performance at industrial sites, property owners cannot make an informed decision about purchasing and installing the technology.

Solution

Through a field demonstration at a chemical processing site, this project will assess the performance and energy savings of the H2AC in a novel market and collect industrial customer feedback. The ability to quantify the savings potential of this technology in large-scale industrial applications will identify key target markets that have the highest energy savings potential. It also addresses existing barriers that limit the market for this product, including lack of installer familiarity, lack of consumer familiarity and/or limits to knowledge of cost/benefit.

With Rheem's H2AC, the WHR components are fully integrated into the rooftop unit, installed at the factory and fully run tested before shipment. This pre-engineered, pre-installed feature greatly minimizes installation errors, which are a common barrier with current retrofit WHR options.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this agreement are to:

- Install the low-cost, low-temperature H2AC WHR system at an industrial food or chemical processing facility within the Southern California Gas service territory;
- Monitor and report on the performance of the H2AC system for at least 12 months following installation at such facility;
- Incorporate collected data from field monitoring to enhance and expand a performance model for estimating energy savings potential of the technology at individual sites.

Exhibit A

Scope of Work Template

Ratepayer Benefits:² This Agreement could result in lower operational costs and increased safety for ratepayers. Once this technology has been demonstrated at an industrial site, ratepayers will benefit from a technology that has been proven to lower the operating cost of their facility. The pre-packaged RTU, with fully integrated WHR components mean minimal training is required to install the system. A simple installation process and pre-tested components mean a leak is less likely to occur, which increases the safety to the facility. Finally, since it is not an “add on” system, there is no perceived fear of voiding warranties of existing equipment.

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California’s statutory energy goals by demonstrating a low-cost, low-temperature WHR system, which is often overlooked since it typically offers a smaller, and correspondingly slower, stream of energy cost savings. As such, this technology has been a chronically underserved market with very few research and development dollars supporting innovation. In addition to the need for field demonstration and third party validation to document cost-effective energy savings for plant managers and decision makers, third-party testing can provide the critical data for future adoption of state codes and standards and financial incentives under utility-run energy efficiency programs.

Hot water systems research receives minimal funding across the U.S. compared to heating, ventilation, and air conditioning (HVAC), lighting, or other essential building systems. With heavy competition among manufacturers for market share of high-ticket items like HVAC systems, maximizing the efficiency of water heating often takes a “back seat”. Given the heavy economic focus on HVAC systems, pursuing a WHR system for low-temperature process water heating can be a risky move for a manufacturer. There is ample precedent for companies to reduce their investment in new programs, and delay or cancel programs that are already underway, if they lack industry and/or government support. This proposed demonstration is needed to help establish the groundwork for large-scale adoption of WHR systems within both commercial and industrial facilities.

Agreement Objectives

The objectives of this Agreement are to:

- Conduct a pilot-scale demonstration of a low-cost, low-temperature waste heat recovery system – Rheem’s H₂AC™ – at an industrial chemical processing site to validate natural gas savings and system performance, and
- Develop a user-friendly performance calculator to determine the system’s performance at any site in any climate.

² California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC “Phase 2” Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

³ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state’s statutory and energy goals.

Exhibit A Scope of Work Template

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, including the Final Report Outline and Final Report

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

- Submit the product to the CAM for acceptance. The CAM may request minor revisions or explanations prior to acceptance.

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software:

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

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:

Exhibit A Scope of Work Template

- 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 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.

Exhibit A Scope of Work Template

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).

Exhibit A Scope of Work Template

- 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.

Exhibit A Scope of Work Template

- The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
-
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
 - Prepare a *Schedule for Completing Agreement Closeout Activities*.
 - Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - Summarize progress made on all Agreement activities as specified in the scope of work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions, including a financial report on Match Fund and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Exhibit A Scope of Work Template

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM. (See *Task 1.1* for requirements for draft and final products.)

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a Final Report for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:
 - Cover page (**required**)
 - Credits page on the reverse side of cover with legal disclaimer (required)
 - Acknowledgements page (optional)
 - Preface (required)
 - Abstract, keywords, and citation page (required)
 - Table of Contents (required, followed by List of Figures and List of Tables, if needed)
 - Executive summary (required)
 - Body of the report (required)
 - References (if applicable)
 - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
 - Bibliography (if applicable)
 - Appendices (if applicable) (Create a separate volume if very large.)
 - Attachments (if applicable)
 - Ensure that the document is written in the third person.
 - Ensure that the Executive Summary is understandable to the lay public.
 - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
 - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
 - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.

Exhibit A Scope of Work Template

- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

- Final Report (draft and final)
- Written Responses to Comments on the Draft Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

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

Exhibit A Scope of Work Template

- 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.

Exhibit A Scope of Work Template

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.

Exhibit A

Scope of Work Template

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.

Exhibit A Scope of Work Template

Products:

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

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: SUBCONTRACT EXECUTION

The goals of this task are to: (1) confirm the availability of the project demonstration site; (2) confirm the availability of a Measurement and Verification (M&V) subcontractor; and (3) execute necessary agreements to secure the demonstration site, installation subcontractor, and M&V subcontractor. For any changes in site location, the Recipient must check with their CAM or CAO who will provide guidance regarding the level of Commission approval required.

Subtask 2.1: Execution of Demonstration Site(s) Subcontract

The Recipient shall:

- Per Subtask 1.9, reach agreement with the manager 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 support staff.
- Execute a subcontract with the demonstration site that confirms the agreement reached above on the Recipient’s use of the site.
- Provide a *Copy of Demonstration Site Subcontract* to CAM.

Products:

- Copy of Demonstration Site Subcontract

Subtask 2.2: Execution of M&V Subcontract

The Recipient shall:

- Execute a subcontract with the competitively-selected M&V subcontractor that secures the contractor’s services during the project, to include following utility M&V protocols, providing required hardware, software, and staff to conduct the required measurements during the project term, and preparing a detailed analytical report that verifies energy consumption and engineering calculations for energy and cost savings.
- If the selected M&V subcontractor becomes unavailable during the project term, work with the CAM to select a new M&V subcontractor.
- Submit a *Copy of the M&V Subcontract* to the CAM.

Products:

- Copy of the M&V Subcontract

Exhibit A Scope of Work Template

TASK 3: SITE INSPECTION, ENGINEERING, INSTALLATION, AND COMMISSIONING

The goal of this task is to complete the installation and commissioning of the H2AC WHR System.

The Recipient shall:

Work with the installation subcontractor to:

- Coordinate with the demonstration site to conduct a comprehensive site survey, detailing the retrofit requirements, infrastructure, utility connections, and space constraints.
- Generate an *Installation Plan*, which includes the results from the site survey, installation layout drawings including the location of the RTU, water storage tank, and piping.
- Coordinate with the demonstration site and identify work activities and resources required to support installation of the H2AC system.
- Ensure all appropriate permit requirements have been met.
- Install the instrumentation and monitoring equipment.
- Issue *Baseline Equipment Instrumentation Report*, after baseline monitoring equipment has been installed, which discusses and describes equipment installations and systems to be monitored.
- Confirm all operational parameters are working properly and the system is fully commissioned, once the H2AC unit has been installed. Provide an *Installed and Commissioned H2AC System Report*, which discusses the results of the commissioning and operational parameters tested.
- Remove the instrumentation and monitoring equipment.
- Prepare a *CPR Report* and participate in a CPR meeting per Subtask 1.3

Products:

- Installation Plan Report (draft and final)
- Baseline Equipment Instrumentation Report
- Installed and Commissioned H2AC System Report

TASK 4: PERFORMANCE MONITORING

The goals of this task are to prepare and implement a detailed test plan for independent monitoring and evaluation of the field performance of the H2AC Waste Heat Recovery System.

Subtask 4.1 Field Site Performance Monitoring

The Recipient shall:

- Prepare a detailed draft *Measurement & Verification of H2AC Demonstration Test Plan* consisting of:
 - Performance objectives
 - The rationale for selection of the test parameters
 - A description of the facilities, equipment, and instrumentation required for the system evaluation
 - Baseline performance objectives and monitoring approach, which will be to monitor the RTU and water heater that is currently installed on the site
 - Waste Heat Recovery performance monitoring approach
 - Preliminary site engineering
 - Usage of engineering tools to optimize the design
 - Description of the data analysis procedures

Exhibit A Scope of Work Template

- The aspects of the M&V to be fulfilled by the independent third-party M&V contractor.
- Appropriateness of instruments, parameters, operating conditions, duration of measurements, and procedures planned for comparing technical and economic performance.
- Prepare a final *Measurement & Verification of H2AC Demonstration Test Plan* that has been reviewed by the entire project team.
- Develop a *Pre-Installation End User Survey* that asks the demonstration site questions regarding end-user satisfaction barriers (noise, hot water capacity, etc.) and asks detailed questions about the site's baseline system.
- Develop a *Pre-Installation Contractor Survey* that asks the installation contractor questions regarding their experience with high-efficiency water heating and HVAC equipment.
- Develop *Post-Installation End User Survey* that compares the demonstration site's experience with the baseline RTU and water heating equipment to the H2AC waste heat recovery RTU and Water Heating Equipment.
- Develop a *Post-Installation Contractor Survey* that asks detailed questions to the installation contractor about their experience installing the waste heat recovery system.
- Install and begin operating the instrumentation and monitoring equipment.
- Work with the selected M&V subcontractor to complete independent third-party testing in accordance with the *Measurement & Verification of H2AC Demonstration Test Plan*
- Compare expected equipment performance to the actual performance. Report this data in the *Monthly Field Performance Reports*.
- Prepare a *Field Performance Report* summarizing all Monthly Field Performance Reports.
- Decommission the instrumentation and monitoring equipment.

Products:

- Measurement & Verification of H2AC Demonstration Test Plan (draft and final)
- Pre-Installation Contractor Survey
- Pre-Installation End User Survey
- Post-Installation End User Survey
- Post-Installation Contractor Survey
- Monthly Field Performance Reports
- Field Performance Report (draft and final)

Subtask 4.2: Performance Calculator

The Recipient shall:

- Incorporate collected field data to enhance and expand an existing *H2AC Performance Calculator* for prospective end users to estimate energy savings potential of the technology. Embedded within the calculator is a polynomial function statistical model that was generated using measured in-site energy. The model inputs are hot water load and ambient enthalpy, and the calculator normalizes the site's performance for the climate using a typical meteorological year data, and estimate's the site's hot water load. The tool will be beta tested with the project team to ensure it is user friendly.
- Summarize changes made to the calculator throughout this task, in the *Updates to H2AC Calculator Report*

Exhibit A Scope of Work Template

Products:

- H2AC Performance Calculator
- Updates to H2AC Calculator Report

TASK 5: 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:
 - 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 project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
 - Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.

Exhibit A

Scope of Work Template

- 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 has 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

TASK 6: 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. 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.

Exhibit A

Scope of Work Template

- 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.
- Provide at least six High-Quality Digital Photographs (minimum resolution of 1300x500 pixels in landscape ratio) of pre- and post-technology installation at the project sites or related project photographs.
- 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)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: GAS TECHNOLOGY INSTITUTE

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

RESOLVED, that the Energy Commission approves Agreement PIR-15-011 from GFO-15-505 with Institute of Gas Technology dba Gas Technology Institute for a \$500,000 grant to conduct a pilot-scale demonstration of a low-cost, low-temperature waste heat recovery system at an industrial chemical processing site to validate natural gas savings and system performance; 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 June 14, 2016.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat