

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement PIR-15-013 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Anish Gautam	51	916-327-2382

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

Title of Project
Demonstration of Water Recovery from Hot, Humid Industrial Exhaust Gases

Term and Amount	Start Date	End Date	Amount
	6/30/2016	3/31/2020	\$ 1,294,032

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
Business Meeting Presenter	Rajesh Kapoor	Time Needed:	5 minutes

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

Agenda Item Subject and Description

INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE (GTI). Proposed resolution approving agreement PIR-15-013 with Institute of Gas Technology dba Gas Technology Institute (GTI) for a \$1,294,032 grant to demonstrate water recovery from hot, humid exhaust gas from an industrial scale drying operation. (Natural Gas funding) Contact: Anish Gautam. (Staff presentation: 5 minutes)

California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
 Yes (skip to question 2) No (complete the following (PRC 21065 and 14 CCR 15378)):
 Explain why Agreement is not considered a "Project":
 Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because
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:
 This project will occur at an existing industrial facility. A small scale closed loop refrigeration heat exchanger will be incorporated in the already existing exhaust stack of a gypsum board dryer to condense flue gas moisture. Project team will design, fabricate, and demonstrate a stand-alone modular demonstration unit to process as much as 10,000 cubic feet per minute of hot, humid, exhaust gas and recover as much as one ton of clean water per hour. An access port will be installed to allow of a portion (10,000 cubic feet per minute) of dryer exhaust gas to be diverted to the demonstration unit and an additional port will be used to return the exhaust gas from the demonstration unit to the dryer exhaust stack. The project team will install the necessary water handling tanks or pipes to collect or transport the recovered water. These activities will not cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment as the demonstrate will recover water from the host site exhaust stack with no impact on raw materials, kiln combustion system, kiln firing rate, or other plant operations.
- b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
- | | |
|---|---|
| <input type="checkbox"/> Initial Study | <input type="checkbox"/> Environmental Impact Report |
| <input type="checkbox"/> Negative Declaration | <input type="checkbox"/> Statement of Overriding Considerations |
| <input type="checkbox"/> Mitigated Negative Declaration | |

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

GRANT REQUEST FORM (GRF)

Legal Company Name:	Budget
Bedrosian & Associates	\$ 50,000
Wilson Engineering Technologies	\$ 97,000
Tetra Tech Inc	\$ 62,942
TBD Electrical Contractor	\$ 45,000
TBD	\$ 28,000
TBD Piping	\$ 65,000
TBD Plumbing	\$ 70,000
USG Gypsum Company	\$ 75,000 (match)
	\$

Exhibit A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Contract Execution
3		Demonstration Test Plan
4	X	Design and Engineering of Water Recovery System
5		Fabrication and Installation of Water Recovery System
6		Baseline Testing without Water Recovery
7		Demonstration Testing with Water Recovery
8		Performance Monitoring, Evaluation and Reporting
9		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities
11		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CLEAR	Clean Liquid Water by Ejector-Assisted Recovery
CO	Carbon Monoxide
CPR	Critical Project Review
M&V	Measurement and Verification
NOx	Nitrogen Oxides
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the demonstration of a novel technology for recovering water from hot and humid industrial exhaust gases. The humid exhaust gases from commercial and industrial drying processes contain 20 to 50% water vapor. The heat of the exhaust gas can be used efficiently to recover clean water. This allows water savings since the clean water can be recycled, and natural gas can be saved because the recovered and recycled warm water takes less energy to heat than cold utility water. Also, the pumping energy to supply fresh water is saved for the recovered and recycled water. Results will vary by application, but utility fresh water savings as high as 20% can be realized, and natural gas savings up to 2% can be realized.

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

B. Problem/ Solution Statement

Problem

Industrial and agricultural dryers, commercial cooking plants, and some chemical processes consume approximately 5 billion gallons of water per year in California. Recovery and reuse of much of this water would help the State meet needed reductions in water demand. The barriers to recovering water have traditionally been the low cost of water and the high equipment and energy cost of water recovery. The need for water recovery is becoming more acute as drought conditions persist.

The two traditional approaches to water recovery are not effective or economical. One approach is to use air-cooled heat exchangers to condense water from exhaust gases. This approach requires large, costly equipment and electricity with higher value than the water recovered. The second approach is to use a vapor-compression refrigeration cycle. This typical refrigeration cycle is more compact but has an even higher electricity demand, making the approach uneconomical and ineffective.

Solution

The Clean Liquid Water by Ejector-Assisted Recovery (CLEAR) process provides the first practical way to recover water from the exhaust gas. An ejector-based cooling cycle driven by the available heat in the exhaust gas, recovers water at low cost. The CLEAR process uses only a small amount of electricity, and the closed cycle cooling loop with no moving mechanical parts is compact, inexpensive, and scalable. The CLEAR process enables the natural gas used in combustion and drying to provide an additional value service by driving water recovery. With this added benefit to natural gas-fired industrial and commercial processes and a 50% market penetration in California, the CLEAR process is estimated to lower California fresh water demand by one billion gallons per year, natural gas savings of 5 million therms, and decreased carbon dioxide emissions by 29,000 tons per year.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

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

Exhibit A Scope of Work

Ratepayer Benefits:² This Agreement will result in the ratepayer benefit of providing industrial users with a straightforward, cost-effective path towards reducing the use of fresh water. Industrial facility efficiency will be increased by accelerating public awareness, and by adoption of the emerging CLEAR water recovery technology for application to industrial dryers, commercial cooking, and other processes that generate low to high temperature exhaust gases with high levels of humidity. Water recovery and reuse in commercial and industrial plants will help ease pressure on overburdened fresh water supplies. The CLEAR process has the potential in many applications to reduce natural gas demand by providing recovered water at a higher temperature than utility fresh water supplies. With a 50% market penetration in California, the CLEAR process is estimated to lower California fresh water demand by one billion gallons per year, natural gas savings of 5 million therms, and decreased carbon dioxide emissions by 29,000 tons per year.

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 validating the performance and cost benefits of the proposed emerging novel CLEAR water recovery technology. The advanced technology demonstrated under this project achieves high-performance with low cost by employing a mass-customization design approach in which predesigned modular CLEAR water recovery units are configured per site-specific load requirements as based upon design criteria generated by an exclusive model. This state-of-the-art approach allows for low-cost, customized CLEAR water recovery units to be fabricated per customer requirements, enabling peak efficiency and performance, and further reducing site-specific engineering and installation costs.

While the benefits of the proposed CLEAR water recovery technology have been shown for generating chilled surfaces that can condense out moisture from humid gases, these benefits have not been demonstrated to recover reusable water from high temperature industrial exhaust gases. This project will demonstrate the benefits of the CLEAR water recovery technology in an industrial dryer application, providing technological breakthrough, which ultimately fosters broad adoption of the technology to reduce fresh water and natural gas consumption in industrial and commercial markets.

Agreement Objectives

The objectives of this Agreement are to:

- Validate the ability of the technology to provide robust and reliable operation for industrial dryer applications
- Achieve a 15 to 25% reduction in fresh water use by recovering and recycling moisture in dryer exhaust gases
- Achieve a natural gas savings up to 2% by using hot recycled water. Calculations will, however, be carried out with data from the demonstration showing the amount of natural gas to be saved by recycling the warm recovered water from the exhaust gas.

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

- Provide sufficient operational flexibility to match real-time variations in facility water load demands
- Demonstrate the cost-benefits of the CLEAR water recovery technology by achieving a payback period of less than four years in a techno-economic analysis
- Comply with local air quality management regulations, with no adverse impacts on NO_x and carbon monoxide (CO) levels

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, 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

- 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:

Exhibit A Scope of Work

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

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

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

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

The goal of this subtask is to determine if the project should continue to receive Energy Commission funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the Energy Commission and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient, and may include the CAO and any other individuals selected by the CAM to provide support to the Energy Commission.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the Energy Commission, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

Exhibit A Scope of Work

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.

Exhibit A Scope of Work

- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any state-owned equipment.
 - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
 - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

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

Products:

- Progress Reports
- Invoices

Exhibit A Scope of Work

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report Outline
- 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.

Exhibit A Scope of Work

- Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
- Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
- If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses 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.

Exhibit A Scope of Work

The Recipient shall:

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

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

- A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
 - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
- A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter
- Supplemental Match Funds Notification Letter (*if applicable*)
- Match Funds Reduction Notification Letter (*if applicable*)

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:

Exhibit A Scope of Work

- 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

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,

Exhibit A Scope of Work

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

Exhibit A Scope of Work

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 CONTRACT EXECUTION

The goals of this task are to: (1) confirm the availability of the project demonstration site(s); (2) confirm the availability of a measurement and verification (M&V) contractor; and (3) execute any agreements necessary to secure the demonstration site and M&V contractor.

Subtask 2.1 Execution of a Contract with the Demonstration Site

The Recipient shall:

- Reach agreement with the manager(s) of the selected demonstration site regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, indemnity, and the project Recipient’s use of any support staff.
- If a selected demonstration site becomes unavailable during the project term, work with the CAM to select a new site.
- Execute a *Contract with the Demonstration Site* that confirms the agreement reached above on the Recipient’s use of the site.

Products:

- Contract with the Demonstration Site

Subtask 2.2 Execution of a Contract with the Selected M&V Contractor

The Recipient shall:

- Confirm the selected M&V contractor’s ability to provide required hardware, software, and staff to conduct the required measurements during the project term.
- Confirm the selected M&V contractor will follow utility M&V protocols, and will prepare a detailed analytical report that verifies energy consumption, water recovery, and engineering calculations for water recovery rates, water quality, energy and cost savings.
- If the selected M&V contractor becomes unavailable during the project term, work with the CAM to select a new M&V contractor.
- Execute a *Contract with the M&V Contractor* to secure the contractor’s services during the project term and confirm the contractor will follow M&V protocol and prepare the detailed analytical report.

Products:

- Contract with the M&V Contractor

Exhibit A Scope of Work

TASK 3 DEMONSTRATION TEST PLAN

The goal of this task is to prepare a detailed test plan to allow for field evaluation of the CLEAR water recovery system performance.

The Recipient shall:

- Prepare and submit *Demonstration Test Plan*, to include, but not limited to:
 - A detailed Draft Demonstration Test Plan consisting of: 1) drivers for the demonstration, 2) performance objectives, 3) the rationale for selection of the test conditions, 4) predicted technology performance based on the results of previous development work, 5) a test matrix showing the number of test conditions and replicated runs, 6) a description of the facilities, equipment, and instrumentation required for the system evaluation, 7) a description of the test procedures, and 8) a description of the data analysis procedures.
 - The M&V details to be fulfilled by the independent third-party M&V contractor. These include 1) project overview, 2) procedure to determine and verify savings, 3) overview of M&V activities, 4) baseline conditions, 5) measurements, 6) savings calculation, 7) utility M&V protocols and 8) references.
 - Measurements for on-site energy (natural gas and electricity) and water use reduction along with plans for on-site reuse (to the extent possible) of CLEAR system produced water.
- Evaluate the Demonstration Test Plan with the project team (including M&V contractor) for appropriateness of instruments, parameters, operating conditions, duration of measurements, and procedures planned for comparing technical and economic performance.

Products:

- Demonstration Test Plan (draft and final)

TASK 4 DESIGN AND ENGINEERING OF WATER RECOVERY SYSTEM

The goal of this task is to generate the demonstration site engineering package, procure ancillary equipment and instrumentation, and prepare the host site for installation of the CLEAR water recovery system.

The Recipient shall:

- Evaluate facility water load demand, and exhaust gas temperature, flow rate and moisture content profiles, prepare system specifications and design the CLEAR water recovery system
- Prepare and submit a *Site Design Package* which includes:
 - Site layout drawings that indicate CLEAR water recovery system integration with the existing host facility process water needs, the dryer exhaust and the overall infrastructure; and utility connections and locations for installation of instrumentation in accordance with the Demonstration Test Plan.
 - A bill of materials identifying the ancillary equipment (pressure/flow regulators, valves, etc.) and materials (pipe, fittings, etc.) required for the installation
 - Specifications for the instrumentation in accordance with the Demonstration Test Plan.
 - Description of any other activities and/or resources required to decommission and remove pre-existing equipment, and support installation of the CLEAR water recovery system.

Exhibit A Scope of Work

- Prepare and submit a *Notification Letter Regarding the Release of the Site Design Package* for installation. The letter will include, but not be limited to, documentation that the complete site design package has been completed, and will include a copy of the overall layout.
- Participate in CPR per Task 1.3 and prepare and submit CPR report

Products:

- Site Design Package (draft and final)
- Notification Letter Regarding the Release of Site Design Package
- CPR report

TASK 5 FABRICATION AND INSTALLATION OF WATER RECOVERY SYSTEM

The goal of this task is to complete the fabrication and installation of the CLEAR water recovery system and commission it for continued operation by the demonstration host facility.

The Recipient shall:

- Confirm approved building applications and permits for the installation of the CLEAR water recovery at the host site are in place
- Procure the ancillary equipment (pressure/flow regulators, valves, etc.) and materials (pipe, fittings, etc.) required for the installation through California-based vendors
- Procure the instrumentation required to satisfy Demonstration Test Plan through California-based vendors
- Solicit bids from California-based equipment fabricators and establish agreement with a selected contractor to fabricate major components of the CLEAR water recovery system
- Fabricate major components of the CLEAR water recovery systems
- Prepare and submit *Notification Letter on Fabrication of Major Components*, which will include, but not be limited to, a summary of bid process, list of equipment to be fabricated, fabrication time, and expected delivery time.
- Solicit bids from California-based installation contractors and establish agreement with a selected contractor capable of fulfilling the CLEAR water recovery system installation efforts
- Conduct a site visit and meet with the installation contractor prior to beginning installation of equipment to coordinate and review the installation scope of work
- Monitor the removal of any pre-existing equipment and supervise the installation of the CLEAR water recovery system and the ancillary equipment required per the installation specifications
- Commission the CLEAR water recovery system for continued operation by the demonstration host facility, ensuring the primary and ancillary components are operating properly within design specifications
- Prepare and submit a *Notification Letter on Installation and Commissioning*, which will include, but not be limited to, a summary of the work done in this task and a confirmation the installation and commissioning of the CLEAR system has been successfully completed.

Exhibit A Scope of Work

Products:

- Notification Letter on Fabrication of Major Components
- Notification Letter on Installation and Commissioning

TASK 6 BASELINE TESTING WITHOUT WATER RECOVERY

The goal of this task is to evaluate the baseline system performance of the dryer without water recovery.

The Recipient shall:

- Gather and analyze data on the performance of the dryer, without water recovery, in accordance with the Demonstration Test Plan. Data will be sufficient to conduct a complete mass and energy balance. Primary data will include air and natural gas inlet flow rates, temperatures, and pressures; electricity use rate; dryer inlet and outlet material rates, moisture content, and temperature; and exhaust gas flow rate, composition, water content, temperature, and pressure.
- Complete independent third-party testing by the selected M&V contractor in accordance with the M&V aspects of the Demonstration Test Plan
- Prepare and submit a *Baseline Performance Report* on findings per the Demonstration Test Plan

Products:

- Baseline Performance Report (draft and final)

TASK 7 DEMONSTRATION TESTING WITH WATER RECOVERY

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

The Recipient shall:

- Gather and analyze data on the performance of the CLEAR water recovery system as installed at the demonstration host facility in accordance with the Demonstration Test Plan. Data collected will include the full set of dryer data listed in Task 6 along with data from operation of the CLEAR system. CLEAR system data will include flow rate, composition, water content, temperature, and pressure of exhaust gas sent to the CLEAR demonstration unit; flow rate, composition, water content, temperature, and pressure of exhaust gas leaving the CLEAR demonstration unit; CLEAR system electricity demand; and flow rate and temperature of water collected in the CLEAR demonstration unit.
- Prepare and submit a *Project Demonstration Test Report* (in accordance with the Demonstration Test Plan) to include but not limited to the following:
 - Conduct rigorous mass and energy balances (of the drying operations) using data collected during the demonstration to confirm the level of natural gas savings. Include results of the mass and energy balances as part of the Demonstration Test Report.

Exhibit A Scope of Work

- Evaluate the system performance and consider any possible improvements in performance or installation engineering that would be of benefit in future deployments
- Provide field service and support for the CLEAR water recovery system to ensure satisfactory operation throughout the field demonstration period
- Discussion of whether the agreement objectives and goals specified in Section II.C were met.

Products:

- Project Demonstration Test Report (draft and final)

TASK 8 PERFORMANCE MONITORING, EVALUATION, AND REPORTING

The goal of this task is to independently evaluate the system performance of the CLEAR water recovery system in accordance with the M&V aspects of the Demonstration Test Plan.

The Recipient shall:

- Gather and analyze data on the performance of the CLEAR water recovery system as installed at the demonstration host facility over an extended monitoring period (at least 6 months) in accordance with the M&V aspects of the Demonstration test Plan. Data collected will duplicate the data set described in Task 7.
- Complete independent third-party testing by the selected M&V contractor in accordance with the M&V aspects of the Demonstration Test Plan
- Provide field service and support for the CLEAR water recovery system to ensure satisfactory operation throughout the M&V period
- Prepare and submit a *Project M&V Report*

Products:

- Project M&V Report (draft and final)

TASK 9 EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

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

Exhibit A Scope of Work

- 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.
- 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.

Exhibit A Scope of Work

Products:

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

TASK 10 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. 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 project.
- When directed by the CAM, participate in conference/workshop(s) sponsored by the California Energy Commission.
- Provide at least (6) 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)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

Exhibit A Scope of Work

TASK 11 PRODUCTION READINESS PLAN

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

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss 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.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Other areas as determined by the CAM.

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

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-15-013 from GFO-15-505 with Institute of Gas Technology dba Gas Technology Institute for a \$1,294,032 grant to demonstrate water recovery from hot, humid exhaust gas from an industrial-scale drying operation; 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