



**GRANT REQUEST FORM (GRF)**

CEC-270 (Revised 02/13)

CALIFORNIA ENERGY COMMISSION



<b>List all key partners:</b> (attach additional sheets as necessary)
Legal Company Name:

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	13-14	501.001H	\$999,889
			\$
			\$
			\$
			\$
			\$
R&D Program Area: EGRO: Renewables		TOTAL:	\$999,889
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	David Morrison			Name:	Ramachandran Narayanamurthy		
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E-Mail:	dmorriso@epri.com			E-Mail:	rnarayanmurthy@epri.com		

Selection Process Used	
<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: PON-14-505
<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"/>	N/A	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<input checked="" type="checkbox"/>	N/A	<input checked="" type="checkbox"/> Attached
3. CEC 105, Questionnaire for Identifying Conflicts	<input checked="" type="checkbox"/>	N/A	<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

### A. Task List

Task #	CPR <sup>1</sup>	Task Name
1		General Project Tasks
2	X	Contract Execution and System Design
3	X	Installation, Testing and Commissioning
4		Data Collection and 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
CHP	Combined Heat and Power
CPR	Critical Project Review
EPRI	Electric Power Research Institute
ORC	Organic Rankine Cycle; Thermodynamic Cycle that converts Heat to Mechanical Energy; or a Machine to Produce Electricity using an Organic Rankine Cycle
NOx	Nitrogen Oxides
TAC	Technical Advisory Committee

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

### A. Purpose of Agreement

The purpose of this Agreement is to fund the innovative application of an integrated waste heat recovery system incorporating environmentally friendly Organic Rankine Cycle (ORC) technology. This application will advance the understanding of the technical and economic feasibility of this technology to cost effectively generate on-site electricity by recovering waste heat at industrial facilities.

### B. Problem/ Solution Statement

#### **Problem**

A large majority of industrial facilities in California generate heat as part of their manufacturing processes. Much of this heat is rejected into the environment at varying temperatures above the ambient levels. Currently, much of the heat is considered “low grade” which is difficult to capture and convert into other forms of useful energy. High temperatures can be converted to steam using proven technology and equipment – referred to as “Rankine Cycle” method. The ORC technology

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

## **Exhibit A Scope of Work**

uses a similar method, but operates at lower temperatures and uses an organic fluid in place of water. Improved manufacturing methods have reduced the cost of the required equipment for ORC and heat capture methods have been developed that could provide industrial and agricultural facilities with the ability to perform on-site electricity generation from capturing existing low-grade waste heat, resulting in multiple benefits including lower energy costs and no additional emissions. However, the proposed ORC technology has not yet been extensively tested and proven in industrial applications to provide meaningful projections of performance and cost benefits such as payback time and return-on-investment. Without funding for the proposed demonstration project, energy advancements for low-grade waste heat recovery will be inhibited.

### **Solution**

The Recipient will implement an innovative on-site electrical generation system designed to demonstrate recovery and use of low-grade waste heat (under 500°F) as energy to drive a turbine-generator set at an industrial site. The proposed generating unit utilizes ORC technology to convert the waste heat into useable energy as a driver for on-site electrical generation.

### **C. Goals and Objectives of the Agreement**

#### **Agreement Goals**

The goals of this Agreement are to:

- Demonstrate through proof-of-concept the design and operation of the ORC unit to generate electricity on-site at an industrial facility. On-site generation of electricity will reduce the cost of electricity purchased from the utility grid, reduce electric demand on the grid, and reduce emissions of criteria pollutants and greenhouse gases associated with the generation of electricity for the grid.
- Advance industry understanding on best practices for design, integration, sizing, and installation of such systems to achieve cost-effective on-site electricity generation.

Ratepayer Benefits: This Agreement will result in the ratepayer benefit of greater economic and environmental benefits through both recovery of wasted energy as well as clean generation through coordinated operation of clean energy components to support power and market systems, particularly during peak times when the grid is stressed or prices are high.

This Agreement will result in the ratepayer benefit of lower costs by demonstrating cost-effective capture of waste heat and ORC turbine technology for on-site electricity generation without the need for additional combustion of fuels. The goal is to determine equipment configurations that can produce electricity at a lower cost than grid-purchased power. Most industrial facilities generate excess heat in some form and the intent of this program is to validate methods for capture and use of that heat.

This Agreement will result in the ratepayer benefit of increased safety by proving the concept of ORC that uses principles similar to steam generation but at far lower temperatures and pressures than required for steam, eliminating the need for certified operators and extensive maintenance procedures.

Technological Advancement and Breakthroughs: This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by advancing pre-commercial ORC technology for industrial applications. This agreement also will enhance understanding of effective strategies for operating

## **Exhibit A**

### **Scope of Work**

disparate clean energy system components in an integrated fashion to achieve electric demand reduction. The technology to be demonstrated is consistent with California's loading order, which prioritizes energy efficiency, then demand response measures, followed by renewables and advanced generation. Moreover, the proposed technology to be demonstrated includes Combined Heat and Power (CHP), which lowers carbon emissions by displacing fossil generation-supplied electricity, supporting California Assembly Bill 32 goals to reduce greenhouse gas emissions and Assembly Bill 1613 which encourages the development of new CHP systems in California.

Nitrogen oxides (NO<sub>x</sub>) are key pollutants in California, and the Los Angeles basin is a non-attainment area. All distributed generation in the area must be compliant with the South Coast Air Quality Management District NO<sub>x</sub> emission rules. The ORC technology uses waste heat and thus is able to generate electricity with no increase in NO<sub>x</sub> emissions. The lack of the need to combust fuels to drive the ORC turbine-generator completely eliminates GHG emissions for the additional electricity generated.

#### **Agreement Objectives**

The objectives of this Agreement are to:

- Develop and implement the architecture for cost-effective and useable methods of low-grade waste heat recovery and application to on-site electrical generation.
- Install and interconnect ORC technology at a designated industrial site which has significant waste heat that can be recovered for electrical generation.
- Develop control strategies, integration and test plans for demonstrating the integrated system and monitoring its performance to achieve peak demand reduction.
- Demonstrate and assess the overall system performance in terms of:
  - Reduction in annual energy use
  - Reduction in CO<sub>2</sub> emissions
  - Annual cost savings and cash flow metrics
- Evaluate the cost-effectiveness and beneficial impacts of the demonstrated system for lowering electricity costs through self-generation.

## Exhibit A Scope of Work

### II. TASK 1 GENERAL PROJECT TASKS

#### PRODUCTS

##### Subtask 1.1 Products

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

##### The Recipient shall:

###### For products that require a draft version

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

###### For products that require a final version only

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

###### For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

- **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.

## **Exhibit A Scope of Work**

- 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.

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

### **MEETINGS**

#### **Subtask 1.2 Kick-off Meeting**

The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

#### **The Recipient shall:**

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

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

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

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

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

## **Exhibit A Scope of Work**

### **The CAM shall:**

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

### **Recipient Products:**

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

### **CAM Product:**

- Kick-off Meeting Agenda

### **Subtask 1.3 Critical Project Review (CPR) Meetings**

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

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

### **The Recipient shall:**

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

### **The CAM shall:**

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.

## **Exhibit A Scope of Work**

- 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 with approval of the CAM.

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
  - Disposition of any state-owned equipment.
  - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
  - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
  - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
  - "Surviving" Agreement provisions such as repayment provisions and confidential products.
  - Final invoicing and release of retention.

## **Exhibit A Scope of Work**

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

### **Products:**

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

## **REPORTS AND INVOICES**

### **Subtask 1.5 Progress Reports and Invoices**

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

### **The Recipient shall:**

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

### **Products:**

- Progress Reports
- Invoices

## **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 and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a Style Manual provided by the CAM.

#### **Subtask 1.6.1 Final Report Outline**

##### **The Recipient shall:**

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

##### **Recipient Products:**

- Final Report Outline (draft and final)

##### **CAM Product:**

- Style Manual

#### **Subtask 1.6.2 Final Report**

##### **The Recipient shall:**

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

##### **Products:**

- Final Report (draft and final)

### **MATCH FUNDS, PERMITS, AND SUBCONTRACTS**

#### **Subtask 1.7 Match Funds**

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of Energy Commission funds.

## **Exhibit A**

### **Scope of Work**

Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

#### **The Recipient shall:**

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

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

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

#### **Products:**

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

#### **Subtask 1.8 Permits**

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

## **Exhibit A Scope of Work**

### **The Recipient shall:**

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

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

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

### **Products:**

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

### **Subtask 1.9 Subcontracts**

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

### **The Recipient shall:**

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

### **Products:**

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

## Exhibit A Scope of Work

### **TECHNICAL ADVISORY COMMITTEE**

#### **Subtask 1.10 Technical Advisory Committee (TAC)**

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

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

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

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

#### **The Recipient shall:**

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

#### **Products:**

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

## **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**

### **III. 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 and System Design**

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

Once the contracts are executed for the site agreements, the team will (3) Create an overall system design based on the baseline energy performance and facility operating requirements that shows the interactions of the various components within the demonstration; (4) develop the equipment installation, ORC interconnection, and customer acceptance plan; (5) Identify M&V requirements and reporting methods to validate the predicted system performance.

#### **Subtask 2.1 Execute a Contract with the Selected Deployment Site**

##### **The Recipient shall:**

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

##### **Products:**

- Deployment Site Contract

#### **Subtask 2.2 Execute 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 that the selected M&V contractor will follow utility M&V protocols, and will prepare a detailed analytical report that verifies natural gas consumption and engineering calculations for natural gas savings.
- If the selected M&V contractor becomes unavailable during the project term, the Recipient shall work with the CAM to select a new M&V contractor.

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### **Scope of Work**

- Execute an *M&V Contract* with the selected M&V contractor that secures the contractor's services during the project term and confirms that the contractor will follow M&V protocol and prepare the detailed analytical report.

#### **Products:**

- M&V Contract

#### **Subtask 2.3 System Design**

##### **The Recipient shall:**

- Develop a system architecture describing the overall integration plan and the relationship between system components in the planned demonstration including characteristics of the waste heat stream at industrial facility (flow, temperature, gas composition, pressure, and variations of characteristics over time).
- Prepare a *System Design Report* that includes but is not limited to the following:
  - A description of existing component and interface options;
  - Selection of components of ORC system for best performance/economics including ORC evaporator and condenser, heat exchangers for facility exhaust ducts, controls, and other balance of plant equipment.
  - A discussion of interface plans and procedures;
  - A discussion of physical connections to integrate waste heat and ORC technology.
- Identify deployment site's acceptance criteria and procedures for equipment installations.
- Outline the overall plan for installation, interconnection, commissioning, and customer acceptance of the ORC, including hot water piping and electrical configurations to be deployed at the site.
- Prepare a *Deployment Plan Report* that includes:
  - A diagram of existing heat, water and energy systems;
  - A diagram specifying location, sizing, and product model of new equipment installation and interconnection plans and procedures;
  - Commissioning and customer acceptance procedures for new equipment installation.
- Prepare *1<sup>st</sup> CPR Report* in accordance with requirements established in subtask 1.3
- Participate in first CPR

#### **Product:**

- System Design Report
- Deployment Plan Report
- 1<sup>st</sup> CPR Report

#### **TASK 3 Installation, Testing and Commissioning**

The goal of this task is to: (1) install field equipment, (2) conduct commissioning activities and (3) demonstrate the operation of waste heat recovery with ORC for achieving effective on-site electrical generation.

## **Exhibit A Scope of Work**

### **The Recipient shall:**

- Install the waste heat recovery/ORC system components at the deployment site.
- Install and interconnect the required heat exchangers to harvest waste heat.
- Conduct customer acceptance testing in accordance with the specifications and procedures established in the System Plan and the Deployment Plan to ensure installed systems conform to plans described therein.
- Perform appropriate commissioning activities to ensure proper installation and operation.
- Prepare an *Installation Checklist* indicating the status of equipment installation and integration.
- Prepare a *Commissioning Checklist* summarizing the outcomes of test procedures implemented.
- Prepare 2<sup>nd</sup> *CPR Report* in accordance with requirements established in subtask 1.3.
- Participate in second CPR.

### **Products:**

- Installation Checklist
- Commissioning Checklist
- 2<sup>nd</sup> CPR Report

### **TASK 4 Data Collection and Monitoring**

The goals of this task are to: (1) record performance of system compared to baseline energy use in the facility; (2) write an M&V Plan, and execute that plan, and (3) write a report that convey the specific performance parameters and outcomes at the demonstration site and also generalize those outcomes for the industrial marketplace. Include comprehensive performance evaluation of ORC system.

### **The Recipient shall:**

- Prepare the *M&V Plan* that includes the following:
  - Historic operational baseline data requirements
  - Project operational data requirements
  - Performance metrics and the related calculations.
  - Requirements for instrumentation, recording intervals, and data collection intervals.
- Facilitate installation and commissioning of the instrumentation as follows:
  - Specify the sensors and meters that shall be installed permanently so that the responsible engineers may include them in their construction documentation.
  - The Recipient or an appropriate sub-contractor shall procure sensors and meters as specified.
  - The Recipient or appropriate sub-contractor shall see to the installation of permanent sensors and meters.
- Procure and commission data loggers and networking equipment to save and transmit all sensor and meter data.
- Initiate data collection, monitoring and analysis. Unless otherwise approved by the project CAM, the data collection and monitoring period shall be for at least one year.
  - Coordinate with ORC manufacturer to regularly obtain ORC sensor data during the monitoring period.
  - Collect historic operational baseline data in accordance with Final M&V Plan

## **Exhibit A Scope of Work**

- Collect project operational data in accordance with Final M&V Plan.
- Download weather station data from the nearest NOAA weather station on a regular basis during the monitoring period.
- Organize, visualize, analyze and present the data on an interim basis to the Energy Commission via monthly progress reports.
  - Periodically calculate performance metrics in accordance with Final M&V Plan
  - Identify potential anomalous data and take corrective action.
  - Investigate optimization opportunities
- Prepare the *M&V Report* that includes the following:
  - Summarize completed M&V activities and performance calculations and methods.
  - Present performance metric calculation results.
- Uninstall data loggers and networking equipment at the end of the M&V effort.
- Calculate cost impacts on energy use as a result of the demonstration. These findings shall be included in the project Final Report.
- Data Acquisition and preliminary analysis shall be reported in appropriate monthly Progress Reports. Final analysis and summary of overall findings from this task shall be reported in the project Final Report.

### **Products:**

- M&V Plan (draft and final)
- M&V Report (draft and final)

### **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.

## **Exhibit A Scope of Work**

- 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.
  - 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.

In addition to the above information the following must be included in the final report.

- A discussion of how the community scale generation and strategies have provided or will provide value and benefits to the community, the local distribution grid, the electric utility, and ratepayers.
- A discussion of the community's use of renewable resources, CHP, innovative generation deployments, demand response, energy storage, and other strategies to help create a more robust grid.
- A discussion of the barriers and solutions to deployment of community scale generation with

## **Exhibit A Scope of Work**

innovative energy management strategies, including, but not limited to, financing options, permitting requirements, and regulatory activities.

- Documentation of the project outcome, either success or failure, as measured in accordance with parameters approved by the Energy Commission.
- Development of business cases that maximize the daily operating value to the community, local distribution grid, and electric utility.
- A discussion of lessons learned and best practices, including a design configuration that provides the highest value with minimal costs, financial and otherwise.

### **Products:**

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire
- Additions to the final report.

### **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.
  - The number of website downloads or public requests for project results.
  - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

## **Exhibit A Scope of Work**

### ***Products:***

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

## **IV. PROJECT SCHEDULE**

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: ELECTRIC POWER RESEARCH INSTITUTE, INC.

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

**RESOLVED**, that the Energy Commission approves Agreement PIR-14-024 from PON-14-505 with **Electric Power Research Institute, Inc.** for a **\$999,889** grant to demonstrate cost-effective distributed generation of electricity at an industrial site using an Organic Rankine Cycle Technology operating on waste heat from industrial driers at a textile drying plant; 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 10, 2015.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

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Harriet Kallemeyn,  
Secretariat