



STATE OF CALIFORNIA

**GRANT REQUEST FORM (GRF)**

CEC-270 (Revised 12/2019)

CALIFORNIA ENERGY COMMISSION

**A) New Agreement # EPC-20-017 (to be completed by CGL office)**

<b>B) Division</b>	<b>Agreement Manager:</b>	<b>MS-</b>	<b>Phone</b>
ERDD	Adam Gottlieb	51	916-445-5294

<b>C) Recipient's Legal Name</b>	<b>Federal ID Number</b>
Treau, Inc.	82-1607290

<b>D) Title of Project</b>
Increasing the Thermal Range and Efficiency of Affordable User-Installable Room Heat Pumps

**E) Term and Amount**

<b>Start Date</b>	<b>End Date</b>	<b>Amount</b>
4/1/2021	3/31/2025	\$ 2,761,606

**F) Business Meeting Information**

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

Proposed Business Meeting Date 3/17/2021 ☐ Consent ☒ Discussion

Business Meeting Presenter Mike Ferreira Time Needed: 5 minutes

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

**Agenda Item Subject and Description:**

**Treau, Inc.** Proposed resolution approving agreement EPC-20-017 with Treau, Inc. for a \$2,761,606 grant to fund the component optimization and cold weather performance tuning of a new low-cost, easy-to-install and high efficiency heating, ventilation and air conditioning appliance that uses low-global-warming-potential refrigerants and adopting staff's determination that this action is exempt from CEQA. (EPIC funding) Contact: Mike Ferreira. (Staff Presentation: 5 minutes).

**G) California Environmental Quality Act (CEQA) Compliance**

1. Is Agreement considered a "Project" under CEQA?

☒ Yes (skip to question 2)

☐ No (complete the following (PRC 21065 and 14 CCR 15378)):

Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:

a) ☒ Agreement **IS** exempt.

☐ Statutory Exemption. List PRC and/or CCR section number:

☒ Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15301

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

Explain reason why Agreement is exempt under the above section: For Cal. Code Regs. (CCR), Title 14, Section 15301: This project will involve manufacturing and product testing to be performed at existing laboratory facilities and large commercial/institutional stakeholder facilities. This project intends to install small-

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scaled equipment into an existing facility, but will have minor alterations to the facility. The tests that will be performed are temporary in nature and will require only minor alternations to existing structures. Work under this project will result in negligible or no expansion of the existing use of facilities at which testing will occur. This project will result in no significant impact to the environment and is exempt pursuant to CCR, § 15301.

- b) Agreement **IS NOT** exempt. (consult with the legal office to determine next steps)

Check all that apply

- ☐ Initial Study  
☐ Negative Declaration  
☐ Mitigated Negative Declaration  
☐ Environmental Impact Report  
☐ Statement of Overriding Considerations

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

Legal Company Name	Budget
Optimized Thermal Solutions, Inc. or TBD	\$ 58,254
TBD	\$ 53,189
	\$
	\$

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

Legal Company Name:

**J) Budget Information**

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	19-20	301.001G	\$2,761,606
			\$
			\$

R&D Program Area: EDMFO: EDMF

TOTAL: \$ 2,761,606

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

**K) Recipient's Contact Information**

**1. Recipient's Administrator/Officer**

Name: Vincent Romanin

Address: 375 Alabama St Ste 220

City, State, Zip: San Francisco, CA  
94110-1361

Phone: 440-371-2901

E-Mail: vince@treau.cool



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**2. Recipient's Project Manager**

Name: Jason Wexler

Address: 375 Alabama St Ste 220

City, State, Zip: San Francisco, CA  
94110-1361

Phone: 530-902-7093

E-Mail: jason@treau.cool

**L) Selection Process Used**

- ☒ Competitive Solicitation      Solicitation #: GFO-20-301  
☐ First Come First Served Solicitation Solicitation #:

**M) The following items should be attached to this GRF**

- |   |  |
|---|--|
| 1. Exhibit A, Scope of Work                                     | <input checked="" type="checkbox"/> Attached |
| 2. Exhibit B, Budget Detail                                     | <input checked="" type="checkbox"/> Attached |
| 3. CEC 105, Questionnaire for Identifying Conflicts             | <input checked="" type="checkbox"/> Attached |
| 4. Recipient Resolution <input checked="" type="checkbox"/> N/A | <input type="checkbox"/> Attached            |
| 5. CEQA Documentation <input checked="" type="checkbox"/> N/A   | <input type="checkbox"/> Attached            |

\_\_\_\_\_  
**Agreement Manager**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Office Manager**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Deputy Director**

\_\_\_\_\_  
**Date**

## EXHIBIT A

### Scope of Work

#### I. TASK ACRONYM/TERM LISTS

##### A. Task List

Task #	CPR <sup>1</sup>	Task Name
1		General Project Tasks
2	X	Fan Optimization
3		Polymer Heat Exchanger Integration
4	X	Cold Climate Reconfiguration
5		Optimized System Integration
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

##### B. Acronym/Term List

Acronym/Term	Meaning
CAD	Computer-aided Design
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
COP	Coefficient of Performance
CPR	Critical Project Review
EER	Energy Efficiency Ratio
GWP	Global Warming Potential
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilation, and Air Conditioning
NEEP	Northeast Energy Efficiency Partnership
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 component optimization and cold weather performance tuning of a new low-cost, easy-to-install, and high efficiency heating, ventilation, and air conditioning (HVAC) appliance that uses low-global-warming-potential refrigerants.

##### B. Problem/ Solution Statement

###### **Problem**

Building HVAC systems consume over 15 percent of all U.S. energy and contribute more to global warming than the entire transportation sector largely due to the high global warming potential

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<sup>1</sup> 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**

(GWP) refrigerant leaks. Off-the-shelf components and products lack the performance which is needed to enable building heating and cooling technology that uses low-GWP refrigerants, is low cost, has high efficiency, and allows the use of electrical power for heating.

#### **Solution**

The Recipient will develop customized fans, heat exchangers, and cold climate configurations that optimize the thermal performance in both heating and cooling mode to minimize power consumption of a high efficiency, low cost, low-GWP refrigerant HVAC system with the potential to reduce building air conditioning energy consumption by up to 30 percent and greenhouse gas emissions by 50 percent.

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

#### **Agreement Goals**

The goals of this Agreement are to:

- Design and source fans and matching motors sets that improve heat transfer vs. power consumption compared to currently available stock components;
- Integrate polymer heat exchanger technology into heat pump system to achieve high heat transfer in a window-friendly form factor; and
- Develop and test system configurations with cold-climate heat generation capabilities.

**Ratepayer Benefits:**<sup>2</sup> This Agreement will result in the ratepayer benefit of lower electricity costs by providing HVAC technology that delivers more efficient heating (70 percent) and cooling (33 percent) that translates to a California household electric bill annual savings of about \$114<sup>3</sup>. It will also increase the penetration of heat pumps.

**Technological Advancement and Breakthroughs:**<sup>4</sup> 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 lowering the cost, increasing the efficiency, and reducing the emissions of building heating and cooling through the development of a vapor-compression HVAC system that incorporates a new ultra-low and high efficiency polymer heat exchanger and a low-GWP refrigerant (e.g. R290).

#### **Agreement Objectives**

The objectives of this Agreement are to:

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<sup>2</sup> 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](http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF)).

<sup>3</sup> Assumes an average California household electric bill of \$1,080 of which space heating is 27 percent and air conditioning is 4 percent, a heating cost reduction of 70 percent, and a cooling cost reduction of 33 percent.

<sup>4</sup> 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

- Design and source custom crossflow and axial fans blades and matching motors that achieve high performance within the space constraints of a user-installed system.
- Optimize custom polymer heat exchangers to maximize heat transfer within the 24" maximum width and weight constraints of a window mounted user-installed system.
- Research and implement cold-climate system configurations which enable product use down to a minimum outdoor temperature of -15°C or lower.

### 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)**. All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All technical tasks should include product(s). 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**

## **EXHIBIT A**

### **Scope of Work**

- Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the California Energy Commission's (CEC) 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.

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

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

## **EXHIBIT A**

### **Scope of Work**

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;
- Invoicing and auditing procedures;
- 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 (subtask 1.5);
  - Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
  - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
    - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
    - Project schedule that identifies milestones
    - List of potential risk factors and hurdles, and mitigation strategy
  - Provide an *Updated Project Schedule*, *Match Funds Status Letter*, and *Permit Status Letter*, 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:**

- Kick-off Meeting Presentation
- Updated Project Schedule (*if applicable*)
- Match Funds Status Letter (subtask 1.7) (*if applicable*)
- Permit Status Letter (subtask 1.8) (*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 CEC 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 CEC and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory



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### **Scope of Work**

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 CEC.

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 CEC, 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 and submit 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.
- 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* with 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)

#### **CAM Products:**

- CPR Agenda
- 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 CEC 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.

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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 procured equipment.
  - The CEC'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 copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

#### **Products:**

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Final 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 Funds and in-state expenditures.

#### **Products:**

- Progress Reports
- Invoices

#### **Subtask 1.6 Final Report**

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### **Scope of Work**

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. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC 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 *Energy Commission Style Manual* provided by the CAM.

**Recipient Products:**

- Final Report Outline (draft and final)

**CAM Product:**

- Energy Commission Style Manual
- Comments on Draft Final Report Outline
- Acceptance 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, Energy Commission 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)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does propose to incorporate and an explanation for why.
- 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.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any

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comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.

- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

#### Products:

- Summary of TAC Comments
- Draft Final Report
- Written Responses to Comments (*if applicable*)
- 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 CEC funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

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

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the CEC 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 CEC 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.
  - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.

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- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

#### **Products:**

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

#### **Subtask 1.8 Permits**

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

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

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

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

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

#### **Products:**

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

## **EXHIBIT A**

### **Scope of Work**

#### **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 each executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

#### **Products:**

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

#### **TECHNICAL ADVISORY COMMITTEE**

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

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

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.

## **EXHIBIT A**

### **Scope of Work**

- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

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

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

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

#### **Products:**

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

#### **Subtask 1.11 TAC Meetings**

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

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

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

## **EXHIBIT A**

### **Scope of Work**

- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

#### **The TAC shall:**

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.
- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan.

#### **Products:**

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

#### **Subtask 1.12 Project Performance Metrics**

**The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.**

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

- **Complete and submit the project performance metrics from the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.**
- **Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.**
- **Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:**
  - **TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.**
  - **TAC comments the Recipient does not propose to incorporate with and explanation why.**
- **Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.**
- **Discuss the *Project Performance Metrics Results* at the Final Meeting.**



## EXHIBIT A

### Scope of Work

#### Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

#### 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: FAN OPTIMIZATION**

The goals of this task are to design and develop performance-optimized fan and motor combinations to maximize energy efficiency, obtain optimized fan and motor components based on these specifications, and test these components. Success for this task involves reducing power used by the indoor and outdoor fans 30 W and 40 W, respectively, as described in the Performance Metrics document.

#### **Subtask 2.1 Design New Indoor and Outdoor Fans**

The goals of this subtask are to define the specifications for indoor and outdoor fan blades that improve system efficiency compared to off-the-shelf options, produce computer-aided design (CAD) designs of fan configurations, and perform simulations of leading candidates.

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

- Define indoor and outdoor fan design specifications for improved fan efficiency. These specifications may include but are not limited to:
  - Off-the-shelf fan blade designs;
  - Efficiencies of packaged fan/motor offerings;
  - Dimension and performance criteria for new fan blades; and
  - Optimal motor specifications.
- Perform fan performance simulations of candidate fan blade designs, including predicted curves of pressure versus flow and power versus flow.
- Compile specifications and simulations, which includes but is not limited to:
  - Existing product specifications;
  - New fan blade design criteria; and
  - Expected system Coefficient of Performance improvements.

Any document, data, test results, or other form of information resulting from or in connection with the above activities is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., possession, license, etc.), except the Energy Commission will have right to view without taking any recording (e.g., pictures, notes etc.) the above activities as necessary for verification purposes. These activities are included in this Scope of Work to ensure the Recipient conducts this work, but the Energy Commission does not have any rights to any resulting information in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient’s ability to commercialize the technology described in this Agreement.

## **EXHIBIT A**

### **Scope of Work**

- Prepare and submit an *Indoor and Outdoor Fan Design Specifications Summary*, which is a high-level executive summary detailing the results of these activities. This summary should not disclose any confidential information.
- Prepare and submit a *Performance Simulations Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.
- Prepare and submit a *Fan Blade Improvement Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Indoor and Outdoor Fan Design Specifications Summary
- Performance Simulations Report
- Fan Blade Improvement Report

#### **Subtask 2.2 Source New Indoor and Outdoor Fan Blades**

The goals of this subtask are to identify original device manufacturers or original equipment manufacturers with capabilities to supply or produce desired fan blade designs, and obtain validated samples of desired fan blade designs from these suppliers.

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

- Contact suppliers with relevant manufacturing capabilities for custom fan blade manufacturing.
- Contact fan blade manufacturers with existing products matching desired specifications or customization capabilities.
- Prepare Request for Quote package.
- Obtain quotes for procurement of samples.
- Obtain quotes for manufacturing of volume components.
- Select a supplier based on cost, timeline, and capability.
- Obtain preliminary standalone blade performance validation results from selected suppliers.
- Obtain samples for in-house testing.

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- Prepare and submit *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings). This report should not disclose any confidential information.
- Participate in a CPR meeting.

## EXHIBIT A

### Scope of Work

#### Products:

- CPR Report #1

#### Subtask 2.3 Source New Motors for Indoor and Outdoor Fans

The goals of this subtask are to identify original device manufacturers or original equipment manufacturers with capabilities to supply or produce desired electric motor designs, and obtain samples of desired motor designs from these suppliers.

#### The Recipient shall:

- Contact suppliers with relevant manufacturing capabilities for custom electric motor manufacturing.
- Contact electric motor manufacturers with existing products matching desired specifications, or customization capabilities.
- Prepare Request for Quote package.
- Obtain quotes for procurement of samples.
- Obtain quotes for manufacturing of volume components.
- Select a supplier based on cost, timeline, and capability.  
Obtain samples for testing.

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- Prepare and submit an *Electric Motor Sourcing Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### Products:

- Electric Motor Sourcing Report

#### Subtask 2.4 Assemble New Indoor and Outdoor Fans

The goal of this subtask is to assemble fan and motor components, along with all ancillary support equipment including fan shrouds or manifolds and control electronics.

#### The Recipient shall:

- Design motor/fan blade interface components.
- Fabricate motor/fan blade interface components.
- Design mounting brackets and fan shrouds.
- Fabricate mounting brackets and fan shrouds.
- Assemble components into fully operable fan modules.

## **EXHIBIT A**

### **Scope of Work**

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- Prepare and submit an *Assembly and Subsystem Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Assembly and Subsystem Report

#### **Subtask 2.5 Test New Indoor and Outdoor Fans Standalone**

The goals of this subtask are to identify fan blade and motor performance and efficiency testing strategies and apparatus, and validate integrated fan blade and motor designs through performance and efficiency testing of the combined fan blade and motor modules.

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

- Identify test equipment required for in-house fan and motor efficiency testing.
- Obtain quotes and lead times for purchase of fan and motor efficiency testing equipment.
- Select the best testing option based on lead time and cost.
- Assemble any necessary testing related components.
- Verify operation of testing equipment. Perform fan and motor efficiency testing.

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- Prepare and submit a *Fan and Motor Efficiency Testing Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Fan and Motor Efficiency Testing Report

## **EXHIBIT A**

### **Scope of Work**

#### **TASK 3: POLYMER HEAT EXCHANGER INTEGRATION**

The goals of this task are to identify and incorporate design changes into the polymer heat exchanger design to allow for integration into the existing heat pump formfactor, manufacture sample polymer heat exchangers including the new design changes, and test the updated designs in a standalone test fixture. Success for this task involves reducing the cost of the polymeric heat exchanger by at least \$10 without reducing its performance, as defined in the Performance Metrics document

##### **Subtask 3.1 Polymer Heat Exchanger Design Review and Design Update**

The goals of this subtask are to identify necessary design changes to the polymer heat exchanger which will allow full integration of the polymer heat exchanger into the existing high efficiency heat pump enclosure, and to update the design of the polymer heat exchanger according to the new specifications identified in the design review.

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

- Review the design details of the high efficiency heat pump indoor unit and identify design constraints for the polymer heat exchanger.
- Update specifications and requirements for the polymer heat exchanger based on the design review.
- Update the CAD design of the polymer heat exchanger according to the updated specifications and requirements identified in the design review.

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- Prepare and submit a *Polymer Heat Exchanger Design Specifications*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

##### **Products:**

- Polymer Heat Exchanger Design Specifications

##### **Subtask 3.2 Polymer Heat Exchanger Fabrication**

The goal of this subtask is to fabricate updated polymer heat exchanger design using existing manufacturing processes.

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

- Design manufacturing tooling based on updated polymer heat exchanger design.

## **EXHIBIT A**

### **Scope of Work**

- Produce three (3) polymer heat exchanger samples using existing manufacturing partners.

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- Prepare and submit a *Polymer Heat Exchanger Manufacturing Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Polymer Heat Exchanger Manufacturing Report

#### **Subtask 3.3 Polymer Heat Exchanger Testing**

The goals of this subtask are to verify the form, fit, and function of the updated polymer heat exchanger design.

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

- Inspect the polymer heat exchanger samples for conformance to quality specifications, geometric specifications, and tolerances.
- Assemble all subcomponents into sample testing modules.
- Build updated standalone polymer heat exchanger test apparatus.
  - Design updated test apparatus based on updated polymer heat exchanger design.
  - Source components for updated test apparatus.
  - Assemble test apparatus.
- Test updated polymer heat exchanger for conformance to mechanical specifications.
- Test updated polymer heat exchanger for conformance to thermal specifications.

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## **EXHIBIT A**

### **Scope of Work**

- Prepare and submit a *Polymer Heat Exchanger Component Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Polymer Heat Exchanger Component Report

#### **TASK 4: COLD CLIMATE RECONFIGURATION**

The goals of this task are to define and model strategies for cold climate performance optimization, identify additional components or component upgrades for improved performance in cold climate operation, identify control strategies for improved operation in cold climates, implement modifications for optimized cold climate operation, test improvements in a cold climate calorimetric chamber. Success for this task involves reducing the minimum operating temperature of the Recipient unit to -15°C or lower, as defined in the Performance Metrics document.

##### **Subtask 4.1 Research Cold Climate Heat Pump Optimizations**

The goals of this subtask are to identify strategies and best practices for high efficiency operation across an extended range of cold outdoor temperatures, identify relevant additional components or component upgrades for optimizing performance at low temperature, and identify software control strategies for optimal cold climate operation.

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

- Research and define best practices for cold climate optimization. This work may include but is not limited to:
  - Performing a literature review to survey research into improvements and optimizations for effective operation of compressors and heat exchanger systems in extended cold range operation. Special attention will be devoted to defrosting and meltwater management.
  - Performing a literature review to survey research into control algorithms and software strategies to optimize performance and minimize energy consumption when operating in cold climates.
  - Performing product tear-downs to investigate competitive optimization strategies.
  - Performing competitive product testing.
- Determine, based on literature review and competitive data system improvements which increase energy efficiency during extended range operation, including:
  - Alternative components;
  - Component changes; and
  - Software control behaviors.
- Draft specifications for component optimizations.
- Contact manufacturers with existing products matching desired specifications or customization capabilities to modify existing components to match specifications.
- Prepare Request for Quote package.
- Obtain quotes for procurement of samples.
- Obtain quotes for manufacturing of volume components.
- Select a supplier based on cost, timeline, and capability.
- Obtain samples for testing.
- Draft software change requests based on optimal control strategy research.

## **EXHIBIT A**

### **Scope of Work**

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- Prepare and submit a *Cold Climate System Optimization Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Cold Climate System Optimization Report

#### **Subtask 4.2 Modify Current Systems for Optimal Cold Climate Performance**

The goal of this subtask is to implement changes identified through the research subtask to improve system performance during cold climate operation.

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

- Retrofit and upgrade heat exchangers, fans, compressor or other components as needed based on changes identified for improved performance at low temperature.
- Write new software modules based on control strategy research.
- Update software codebase to incorporate functionality identified for improved cold climate control strategies.

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- Prepare and submit a *Cold Climate System Integration Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Cold Climate System Integration Report

#### **Subtask 4.3 Test Modified Systems in Cold Climate Chamber**



## **EXHIBIT A**

### **Scope of Work**

The goals of this subtask are to establish a testing protocol and perform tests to validate cold climate design changes and component selection.

**The Recipient shall:**

- Design testing protocol based on Northeast Energy Efficiency Partnership (NEEP) guidelines
- Perform testing
- Evaluate performance based on NEEP guidelines

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- Prepare *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings). This report should not disclose any confidential information.
- Participate in a CPR meeting.

**Products:**

- CPR Report #2

#### **TASK 5: OPTIMIZED SYSTEM INTEGRATION**

The goals of this task are to downselect modifications and incorporate improvements identified in Cold Climate Optimization Task 4, design final systems using downselected optimized components and upgrades, and validate final system performance both in the lab and in field installations. Success for this task involves achieving a heating seasonal performance factor (HSPF) rating of 8.2 or higher and an energy efficiency ratio (EER) rating of 11.5 or higher.

##### **Subtask 5.1 Design Fully Integrated Optimized System for Cold Climate Use, including New Fans and Polymer Heat Exchanger**

The goals of this subtask are to update existing product designs to incorporate all cold climate optimized components including polymer heat exchangers, and perform any additional operational adjustments identified during initial cold climate testing.

**The Recipient shall:**

- Define specifications for fully integrated cold climate optimized test device.
- Identify ancillary components required for completion of a unit for testing.
- Design ancillary components.
- Make any necessary design changes to existing heat pump design to enable integration of new cold climate optimized fans, polymer heat exchangers, and any other components or subsystems which have been upgraded for improved cold climate performance.

## **EXHIBIT A**

### **Scope of Work**

- Compile system specifications.

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- Prepare and submit a *Fully Integrated Cold Climate System Design and Integration Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Fully Integrated Cold Climate System Design and Integration Report

#### **Subtask 5.2 Design Fully Integrated Cold Climate Optimized Reference System**

The goal of this subtask is to update existing product designs with cold climate optimized components to provide a reference system and baseline for evaluating cold climate performance using improved fan blade and motor modules only.

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

- Define specifications for a cold climate optimized test device incorporating improved fan blade and motor modules only.
- Identify ancillary components required for completion of a unit for testing.
- Design ancillary components.
- Make any necessary design changes to existing heat pump design to enable integration of new cold climate optimized fan blade and motor modules, and any other components or subsystems which have been upgraded for improved cold climate performance not including the updated polymer heat exchanger.

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- Prepare and submit a *Compile Reference System Design and Integration Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

## **EXHIBIT A**

### **Scope of Work**

#### **Products:**

- Reference System Design and Integration Report

#### **Subtask 5.3 Source Any Additional Components for Fully Integrated Cold Climate Optimized Prototype**

The goals of this subtask are to identify original device manufacturers or original equipment manufacturers with capabilities to supply or produce any additional components required for upgraded prototypes, and obtain samples of desired components from these suppliers.

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

- Contact suppliers with relevant manufacturing capabilities for fabrication of desired components.
- Contact manufacturers with existing products matching desired specifications, or customization capabilities.
- Prepare Request for Quote package.
- Obtain quotes for procurement of samples.
- Obtain quotes for manufacturing of volume components.
- Select a supplier based on cost, timeline, and capability.
- Obtain samples for testing.

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- Prepare and submit a *Fully Integrated Prototype Component Samples and Sourcing Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Fully Integrated Prototype Component Samples and Sourcing Report

#### **Subtask 5.4 Fabricate Cold Climate Optimized Prototypes**

- The goals of this subtask are to convert existing heat pump units into new cold climate optimized prototypes incorporating the polymer heat exchanger, and to convert existing heat pump units into reference systems which exclude the polymer heat exchanger but include all other cold climate modifications.

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

- Purchase any additional components identified in the sourcing Subtask 5.3.
- Fully assemble remaining subsystems.
- Perform required modifications to the existing heat pump units.

## **EXHIBIT A**

### **Scope of Work**

- Incorporate upgraded heat pump units and assembled cold climate optimized subsystems into complete working test units.

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- Prepare and submit a *Cold Climate Prototype Manufacturing Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

- Cold Climate Prototype Manufacturing Report

#### **Subtask 5.5 Perform Lab Testing on Cold Climate Optimized Prototypes**

The goal of this subtask is to perform tests to validate final cold climate design changes and component selection.

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

- Create a *Cold Climate Optimized Prototype Performance Lab Test Plan* document that describes a test setup, tests to be performed, and what will be evaluated by this laboratory test. This report should not disclose any confidential information.
- Perform testing in controlled test chamber environment.
- Collect test data.
- Calculate expected HSPF and EER ratings.

Any document, data, test results, or other form of information resulting from or in connection with the above activities is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., possession, license, etc.), except the Energy Commission will have right to view without taking any recording (e.g., pictures, notes etc.) the above activities as necessary for verification purposes. These activities are included in this Scope of Work to ensure the Recipient conducts this work, but the Energy Commission does not have any rights to any resulting information in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Prepare and submit a *Cold Climate Optimized Prototype Performance Lab Test Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

#### **Products:**

## **EXHIBIT A**

### **Scope of Work**

- Cold Climate Optimized Prototype Performance Lab Test Plan
- Cold Climate Optimized Prototype Performance Lab Test Report

#### **Subtask 5.6 Perform Field Testing on Cold Climate Optimized Prototype**

The goal of this subtask is to perform field tests to validate final cold climate design changes and component selection.

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

- Create a *Cold Climate Optimized Performance Field Test Plan* document that describes a test setup, tests to be performed, and what will be evaluated by this field test. This report should not disclose any confidential information.
- Identify and select locations with suitable climates for field testing.
- Perform field installations in selected locations.
- Conduct testing of units in real world conditions.
- Collect test data.
- Evaluate performance based on expected results from lab testing.

Any document, data, test results, or other form of information resulting from or in connection with the above activities is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., possession, license, etc.), except the Energy Commission will have right to view without taking any recording (e.g., pictures, notes etc.) the above activities as necessary for verification purposes. These activities are included in this Scope of Work to ensure the Recipient conducts this work, but the Energy Commission does not have any rights to any resulting information in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Prepare and submit a *Cold Climate Optimized Performance Field Test Report*, which is a high-level executive summary detailing the results of these activities. This report should not disclose any confidential information.

##### **Products:**

- Cold Climate Optimized Performance Field Test Plan
- Cold Climate Optimized Performance Field Test Report

#### **Subtask 5.7: Optimization Strategy Downselection**

The goals of this subtask are to review data and results from cold climate optimization work and system testing, perform a cost/benefit analysis on the performance and price impact of cold climate optimizations, and select final components and strategies for maximizing energy efficiency across an extended temperature range.

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

- Compare performance test data across all system improvements.
- Review component cost and manufacturing costs.
- Analyze performance test data results against cost of improvements.
- Perform final downselection of all components, algorithms, and system designs.
- Determine ideal system specifications and configuration for productization.

## EXHIBIT A

### Scope of Work

Any document, data, test results, or other form of information resulting from or in connection with the above activities is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., possession, license, etc.), except the Energy Commission will have right to view without taking any recording (e.g., pictures, notes etc.) the above activities as necessary for verification purposes. These activities are included in this Scope of Work to ensure the Recipient conducts this work, but the Energy Commission does not have any rights to any resulting information in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Prepare and submit a *Cold Climate Optimized Product Design Report*, which is a high-level executive summary detailing the results of these activities. This report should not contain any confidential information.

#### **Products:**

- Cold Climate Optimized Product Design Report

#### **TASK 6: EVALUATION OF PROJECT BENEFITS**

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

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

- **Complete the *Initial Project Benefits Questionnaire*. The *Initial Project Benefits Questionnaire* shall be initially completed by the Recipient with 'Kick-off' select for the 'Relevant data collection period' and submitted to the CAM for review and approval.**
- **Complete the Annual Survey by December 15 of each year. The Annual Survey includes but is not limited to the following information:**
  - **Technology commercialization progress**
  - **New media and publications**
  - **Company growth**
  - **Follow-on funding and awards received**
- **Complete the *Final Project Benefits Questionnaire*. The *Final Project Benefits Questionnaire* shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.**
- **Respond to CAM questions regarding the questionnaire drafts.**
- **Complete and update the project profile on the CEC's public online project and recipient directory at [www.energizeinnovation.fund](http://www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.**
- **If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient**

## EXHIBIT A

### Scope of Work

directory at [www.energizeinnovation.fund](http://www.energizeinnovation.fund), and provide Documentation of Organization Profile on EnergizeInnovation.fund, including the profile link.

#### **Products:**

- Initial Project Benefits Questionnaire
- Annual Surveys
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund
- Documentation of Organization Profile on EnergizeInnovation.fund

#### **TASK 7: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

The goal of this task is to conduct activities that will accelerate the commercial adoption of the technology being supported under this agreement. Eligible activities include, but are not limited to, the following:

- Scale-up analysis including manufacturing analysis, independent design verification, and process improvement efforts.
- Technology verification testing, or application to a test bed program located in California.
- Legal services or licensing to secure necessary intellectual property to further develop the technology
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

#### **The Recipient Shall:**

- Develop and submit a *Technology Transfer Plan (Draft/Final)* that identifies the proposed activities the Recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the *Draft Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Technology Transfer Plan*. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the *Final Technology Transfer Plan*.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the *Final Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in *Final Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report (Draft/Final)* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the *Final Technology Transfer Plan*. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.

## **EXHIBIT A**

### **Scope of Work**

- 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.

#### **Products:**

- Technology Transfer Plan (Draft/Final)
- Summary of TAC Comments
- Technology Transfer Summary Report (Draft/Final)
- High Quality Digital Photographs

#### **V. PROJECT SCHEDULE**

Please see the attached Excel spreadsheet.



STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: TREAU, INC.

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

**RESOLVED**, that the CEC approves Agreement EPC-20-017 with Treau, Inc. for a \$2,761,606 grant to fund the component optimization and cold weather performance tuning of a new low-cost, easy-to-install and high efficiency HVAC appliance that uses low global warming potential refrigerants; and

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

**CERTIFICATION**

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on March 17, 2021.

AYE:

NAY:

ABSENT:

ABSTAIN:

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Patricia Carlos  
Secretariat