

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-16-010 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Brad Williams	51	916-327-3312

Recipient's Legal Name	Federal ID Number
The Regents of the University of California on behalf of the Davis campus	94-6036494

Title of Project
Improving Water and Energy Efficiency in California's Dairy Industry

Term and Amount	Start Date	End Date	Amount
	10/1/2016	9/30/2020	\$ 1,000,000

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

Proposed Business Meeting Date	8/10/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Brad Williams	Time Needed:	5 minutes
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Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description

REGENTS OF THE UNIVERSITY OF CALIFORNIA (UNIVERSITY OF CALIFORNIA, DAVIS). Proposed resolution approving Agreement EPC-16-010 with Regents of the University of California (University of California, Davis) for a \$1,000,000 grant to research the viability of two California dairy cattle cooling technologies aimed to reduce heat exposure and cool cattle while reducing overall water and energy consumption. Research will compare two methods, conduction cooling and targeted convection cooling, at the UC Davis Dairy. The cooling approach that shows the most promise from the preliminary testing will be pilot tested at a dairy in Tulare, California.

California Environmental Quality Act (CEQA) Compliance

- Is Agreement considered a "Project" under CEQA?
 - Yes (skip to question 2)
 - No (complete the following (PRC 21065 and 14 CCR 15378)):
Explain why Agreement is not considered a "Project":
Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because
- If Agreement is considered a "Project" under CEQA:
 - a) Agreement **IS** exempt. (Attach draft NOE)
 - Statutory Exemption. List PRC and/or CCR section number: _____
 - Categorical Exemption. List CCR section number: Cal. Code Regs., tit 14, § 15301 -- Cal. Code Regs., tit 14, § 15306
 - Common Sense Exemption. 14 CCR 15061 (b) (3)
Explain reason why Agreement is exempt under the above section:
California Code Regulations, Title 14, Section 15301 provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing at the time of the lead agency's determination, are categorically exempt from the provisions of the California Environmental Quality Act. This project involves the installation of cooling technologies for installation in existing free-stall dairy barns to improve energy and water efficiency.

The first pilot will be at UC Davis and the other will be a dairy in Tulare. Also added to the installation will be data monitoring and measurement equipment. Installation of equipment necessary for measurement and verification activities will be limited to instrumentation for data collection and analysis and will not alter existing facility equipment or operations. Therefore, the project will not have a significant effect on the environment and falls within section 15301.

California Code Regulations, Title 14, Section 15306 provides that projects which consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource are categorically exempt from the provisions of CEQA. This project entails data collection and performance evaluation to document energy and water savings of cooling technologies to be installed in existing dairy barns. The results will include technical reports and presentations to disseminate the results. For these reasons, the project will not have a significant effect on the environment and falls within section 15306.
 - b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)

Check all that apply

GRANT REQUEST FORM (GRF)



<input type="checkbox"/> Initial Study	<input type="checkbox"/> Environmental Impact Report
<input type="checkbox"/> Negative Declaration	<input type="checkbox"/> Statement of Overriding Considerations
<input type="checkbox"/> Mitigated Negative Declaration	

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

Legal Company Name:	Budget
Integrated Comfort, Inc.	\$ 95,000
	\$

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

Legal Company Name:
Diversitech Marketing LLC (Match only)

Budget Information

Funding Source	Funding Year of Appropriation	Budget List No.	Amount
EPIC	15-16	301.001C	\$1,000,000
			\$
R&D Program Area: EERO: IAW		TOTAL:	\$1,000,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	Maria Fernandez Terrasa			Name:	Nelson Dichter		
Address:	215 Sage St., Suite 100			Address:	215 Sage St., Suite 100		
City, State, Zip:	Davis, CA 95616			City, State, Zip:	Davis, CA 95616		
Phone:	530-752-2659 /	Fax:	- -	Phone:	530-752-3008 /	Fax:	- -
E-Mail:	mefernandez@ucdavis.edu			E-Mail:	ndichter@ucdavis.edu		

Selection Process Used

<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: GFO-15-317
<input type="checkbox"/> First Come First Served Solicitation	

The following items should be attached to this GRF

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

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

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Phase 1 Planning, Experimental Design, and Installation
3	X	Phase 1 Experimental Plan Execution and Data Collection
4		Phase 2 Planning, Experimental Design, and Installation
5		Phase 2 Experimental Plan Execution, Data Collection, and Analysis
6		Behavioral and Market Analysis
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CC	Conduction Cooling
CPR	Critical Project Review
SWEC	Sub-Wet bulb Evaporative Chiller
TAC	Technical Advisory Committee
TCC	Targeted Convection Cooling
UC Davis	University of California, Davis

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a pilot-scale demonstration of two novel approaches to cooling dairy cattle during hot summer months in California. In the first approach, conduction cooling (CC), the bedding area beneath the cow will be cooled using heat exchange mats embedded in the soil. In order to reduce energy consumption, water flowing through the heat exchange mats will be chilled using a novel Sub-Wet Bulb Evaporative Chiller (SWEC). The second approach, targeted convection cooling (TCC), will use fabric ducting to direct cool air on the cows. The air will be cooled using a high-efficiency direct evaporative cooler. Both of these approaches promise significant water and energy savings compared to the baseline.

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

Exhibit A

Scope of Work

B. Problem/ Solution Statement

Problem

California is ranked first in the U.S. in the production of total milk, butter, ice cream, nonfat dry milk, and whey protein concentrate and is ranked second in cheese production. Approximately one out of every five dairy cows (20%) in the U.S. lives in California. Currently there are 1,450 dairies in California that house 1.78 million milk cows. A majority of these dairies are located in the Central Valley where summers are very hot and dry (i.e., have low humidity). To reduce heat exposure and cool cattle, California dairy farmers rely mainly on various forms of forced convection and evaporative cooling systems such as large circulation fans and high-water-volume feed lane soaking systems. These systems work by enhancing convective heat transfer and reducing the ambient air temperature through the evaporation of water. However, these cooling systems require significant amounts of water and electricity.

Solution

By developing an optimal cooling approach for dairy cows under California summer climate conditions, this project has the potential to significantly reduce statewide water and energy consumption. The two approaches being investigated and their potential to save energy and water are described below:

- Approach A: Conduction Cooling (CC) - In this approach, the bedding area beneath the cow will be cooled using heat exchange mats embedded in the soil. Water flowing through the heat exchange mats will be chilled using a novel low-energy-consuming Sub-Wet Bulb Evaporative Chiller (SWEC). CC has the potential to reduce electricity use by 38%, and water consumption by 73%.
- Approach B: Targeted Convection Cooling (TCC) - In this approach, fabric ducting will be used to direct cool air on the cows. The air will be cooled using a high-efficiency direct evaporative cooler. TCC has the potential to reduce electricity use by 28% and water consumption by 86%.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of this Agreement is to develop an optimal cooling approach that will effectively cool dairy cows under California summer climate conditions and use significantly less energy and water than current dairy cooling systems being implemented. The objective is to demonstrate, on a pilot scale, two innovative approaches to cooling dairy cattle in California.

Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater electricity reliability and lower costs by reducing electricity use between 28-38%, while also reducing water consumption by 73-86%. California has 1,450 dairies milking 1.78 million dairy cows. An implementation of these technologies in 10% of dairies with an estimated 30% energy savings and 80% water savings equates to 7.5 million kWh of electricity and 4,990 acre-feet of water per year.

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

Exhibit A Scope of Work

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by demonstrating, on a relevant pilot scale, novel approaches that use high-efficiency evaporative cooling technologies to manage heat stress in cattle for the dairy industry. The technologies will result in both energy and water savings compared to current practices.

Agreement Objectives

The objective of this Agreement is to demonstrate, on a pilot scale, two innovative approaches to cooling dairy cattle in California; Conduction Cooling (CC) and Targeted Convection Cooling (TCC). The project will consist of two phases. In Phase I, to be performed in the UC Davis dairy, the CC and TCC approaches will be demonstrated in a comparative study. In Phase II, to be performed in a commercial dairy in Tulare, the best performing approach from Phase I will be installed and monitored over a period of two 6-month summer periods. The UC Davis dairy site for Phase I will permit detailed monitoring of energy and water use as well as animal behavior on a smaller scale. The commercial dairy in Tulare will permit a larger, pilot scale demonstration of the selected cooling approach from Phase I, thereby setting the stage for a thorough technology adoption behavioral study and market analysis. In both phases, a baseline control consisting of fans and soakers will be used to assess the performance of the CC and TCC approaches.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

For products that require a draft version, including the Final Report Outline and Final Report

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

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

Exhibit A Scope of Work

- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

○ **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format.
- The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

○ **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.
- C# Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

Exhibit A Scope of Work

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.

The CAM shall:

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

Recipient Products:

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

Exhibit A Scope of Work

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

Exhibit A Scope of Work

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

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

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

Products:

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

Exhibit A Scope of Work

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

The Recipient shall:

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

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a Final Report for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:

Exhibit A Scope of Work

- Cover page (**required**)
- Credits page on the reverse side of cover with legal disclaimer (required)
- Acknowledgements page (optional)
- Preface (required)
- Abstract, keywords, and citation page (required)
- Table of Contents (required, followed by List of Figures and List of Tables, if needed)
- Executive summary (required)
- Body of the report (required)
- References (if applicable)
- Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
- Bibliography (if applicable)
- Appendices (if applicable) (Create a separate volume if very large.)
- Attachments (if applicable)
- Ensure that the document is written in the third person.
- Ensure that the Executive Summary is understandable to the lay public.
 - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
 - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
 - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.

- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

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

Exhibit A Scope of Work

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

The Recipient shall:

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

Exhibit A Scope of Work

Subtask 1.8 Permits

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

The Recipient shall:

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

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

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

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each Subcontract required to conduct the work under this Agreement.

Exhibit A Scope of Work

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

Products:

- Subcontracts (draft if required by the CAM)

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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

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

The Recipient shall:

- Prepare a List of Potential TAC Members that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.

Exhibit A Scope of Work

- Prepare a List of TAC Members once all TAC members have committed to serving on the TAC.
- Submit Documentation of TAC Member Commitment (such as Letters of Acceptance) from each TAC member.

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

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

Products:

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

Exhibit A Scope of Work

IV. TECHNICAL TASKS

TASK 2: PHASE 1 PLANNING, EXPERIMENTAL DESIGN, AND INSTALLATION

The goal of this task is to develop the Phase 1 experimental design, followed by procurement and installation of the two cooling approaches and the baseline approach in the UC Davis dairy.

The Recipient shall:

- Develop a Phase 1 experimental plan including but not limited to:
 - Experimental design for the cooling approaches
 - Experimental design of cattle productivity and health
 - Computational fluid dynamics modeling of aspects of CC and TCC; installation and instrumentation of CC & TCC
- Procure and install equipment and instrumentation including but not limited to:
 - SWEC chiller for CC
 - Evaporative cooler for TCC
 - CC & TCC equipment and corresponding instrumentation
 - Cattle monitoring instrumentation
 - Baseline equipment (fans and soakers)
- Prepare and provide a *Phase 1 Experimental Development Report* discussing all work conducted in Task 2 including but not limited to :
 - Procurement and installation of equipment
 - Research conducted and results
 - Copy of experimental plan
 - Copies of dataset(s) generated in pdf and excel format

Product:

- Phase 1 Experimental Development Report (draft and final)

TASK 3: PHASE 1 EXPERIMENTAL PLAN EXECUTION AND DATA COLLECTION

The goal of this task is to collect data on the CC, TCC and baseline approaches in the UC Davis dairy during 6 summer months in 2017. The efficacy of the new cooling approaches will be determined by combining the analysis of the cooling system performance with the physiological measurements of the cows. The key outcome from this comparative study in Task 3 will be to select one of the approaches (TCC or CC) to pursue in Phase 2.

The Recipient shall:

- Complete work as described in the experimental plan developed in Task 2 including but not limited to:
 - Monitoring and analyzing performance metrics of cooling system including but not limited to energy use, water use and efficiency compared to outdoor conditions for a period of at least 6 months
 - Monitoring and analyzing cattle behavioral metrics including but not limited to respiration rate, core body temperature, panting, and milk productivity for a period of at least 6 months
 - Providing the recorded dataset of the monitoring metrics defined in this task for both the CC and TCC compared to baseline approaches

Exhibit A Scope of Work

- Prepare and provide a *Phase 1 Field Test Report* discussing all work conducted in Task 3 including but not limited to :
 - Results from implementing the experimental plan
 - Comparison of technologies based on performance and behavioral metrics
 - Determination on preferred cooling method for installation in pilot scale testing
 - Copies of dataset(s) generated in pdf and excel format
- Prepare a *CPR Report* and participate in a CPR meeting according to Subtask 1.3

Products:

- Phase 1 Field Test Report (draft and final)
- CPR Report

TASK 4: PHASE 2 PLANNING, EXPERIMENTAL DESIGN, AND INSTALLATION

The goal of this task is to develop the Phase 2 experimental design, followed by installation of the cooling approach selected in Phase 1. The selected cooling approach will be installed in a freestall pen at a commercial dairy in Tulare. Instrumentation will then be installed in two freestall pens, one in which the selected cooling approach will be installed and a second unmodified freestall pen which will be used as a baseline.

The Recipient shall:

- Develop a Phase 2 experimental plan including but not limited to:
 - Experimental design of the TCC or CC cooling approach, including analysis of pressure and thermal losses
 - Experimental design of cattle productivity & health
- Design and develop an evaporative cooler or SWEC specific to dairy application
- Procure and install equipment and instrumentation for either the TCC or CC cooling approach including but not limited to:
 - SWEC chiller for CC
 - Evaporative cooler for TCC
 - CC & TCC equipment and corresponding instrumentation
 - Cattle monitoring instrumentation
- Prepare and provide a *Phase 2 Experimental Development Report* discussing all work conducted in Task 4 including but not limited to:
 - Design and development of the equipment selected from Task 3 (Either TCC or CC)
 - Procurement and installation process
 - Copy of experimental plan
 - Copies of datasets generated in pdf and excel format

Product:

- Phase 2 Experimental Development Report (draft and final)

Exhibit A Scope of Work

TASK 5: PHASE 2 EXPERIMENTAL PLAN EXECUTION, DATA COLLECTION, AND ANALYSIS

The goal of this task is to collect data on the CC or TCC and baseline approaches in the freestall pens at the commercial dairy in Tulare over a period of two summers for a total of 12 months of data. The data will be analyzed to provide water and energy savings of the cooling approach compared with baseline while noting any changes in milk production. Information from Phase 1 and Phase 2 will be used to develop a design tool of the new cooling approach to be usable by an installer or a potential customer to determine the sizing of the evaporative cooler/SWEC and the potential water and energy savings depending on the selected climate zone in CA.

The Recipient shall:

- Complete work as described in the experimental plan developed in task 4 including but not limited to:
 - Monitor and analyze performance metrics of cooling system over a minimum 12 month period (two 6-month summer periods)
 - Monitor and analyze cattle behavior and milk production metrics over a minimum 12 month period (two 6-month summer periods)
- Develop and document a design tool for public use to facilitate market adoption of the chosen technology. The tool should be free for design consultants and available for download on the internet. The tool will include as inputs geographical location within California, number of cows per pen, current water and energy use per cow/pen. The comfort basis for water and energy use will be derived from the case studies performed as a part of the project. The design tool outputs should include but not be limited to:
 - Pre- and post-installation energy and water savings
 - Heating, Ventilation, and Air Conditioning equipment requirement including sizing.
 - A first-cut equipment and installation cost estimate.
- Prepare and provide the recorded dataset and findings of the post-installation monitoring metrics defined in Task 2 for CC or TCC vs baseline approach and design tool.
- Prepare and provide a *Phase 2 Field Test Report* discussing all work conducted in Task 5 including but not limited to :
 - Results from implementing the experimental plan
 - Analysis of performance and behavioral metrics
 - Development of the design tool and features included
 - Research conducted and results
 - Discussion of whether the goals and objectives identified in Section II. C of this scope were met.
 - Copies of datasets generated in pdf and excel format

Product:

- Phase 2 Field Test Report (draft and final)

Exhibit A Scope of Work

TASK 6: BEHAVIORAL AND MARKET ANALYSIS

The goal of this task is to develop an in-depth understanding of user experience with the technology, and the challenges that must be addressed to facilitate accelerated deployment. The data collected will be used to describe the barriers to market deployment and identify opportunities to accelerate the process.

The Recipient shall:

- Conduct a behavior analysis of technology usage including but not limited to:
 - User experience with and assessment of proposed technology
 - User willingness to adopt proposed technology at a larger scale
 - User concerns with proposed technology and commercial support needs
- Conduct analysis of market barriers and opportunities to accelerate technology deployment including but not limited to:
 - Identify stakeholder barriers to technology adoption/deployment
 - Identify opportunities to address market barriers and accelerate market deployment
 - Develop an economic model to estimate expected return on investment
- Provide a *Behavioral and Market Analysis Report* discussing all work conducted in Task 6 including but not limited to :
 - A copy of survey(s)/interview(s) questions and results
 - Research and analysis conducted and results
 - Identification of market barriers, opportunities and economics for the dairy industry
 - Copies of datasets generated in pdf and excel format

Product:

- Behavioral and Market Analysis Report (draft and final)

TASK 7: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

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

Exhibit A Scope of Work

- Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:

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

Exhibit A Scope of Work

TASK 8: 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(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

V. PROJECT SCHEDULE

Please see the attached Exhibit A Attachment A-1.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: UNIVERSITY OF CALIFORNIA, DAVIS

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

RESOLVED, that the Energy Commission approves Agreement EPC-16-010 from GFO-15-317 with the Regents of the University of California, on behalf of the Davis campus, for a \$1,000,000 grant to research the viability of two dairy cattle cooling technologies to reduce heat exposure and cool cattle while reducing overall water and energy consumption. Research will compare two methods, conduction cooling and targeted convection cooling, at the UC Davis Dairy. The cooling approach that shows the most promise from the preliminary testing will be pilot tested at a dairy in Tulare, California; 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 August 10, 2016.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat