California Energy Commission
February 12, 2025 Business Meeting
Backup Materials for The Regents of the University of California, on behalf of the Davis Campus

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Grant Request Form
3. Scope of Work

[PROPOSED]

RESOLUTION NO: 25-212-09b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: The Regents of the University of California, on behalf of the Davis Campus

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-24-034 with The Regents of the University of California, on behalf of the Davis Campus (UCD) for a $5,000,000 grant. This agreement will create a virtual power plant (VPP) as a collaborative initiative among three public entities in Yolo County: the Yolo County government, the City of Davis government, and UCD, along with an established VPP operator. The VPP will manage cooling demand at the community level to reduce peak electrical demand on hot summer days; and

FURTHER BE IT RESOLVED, that the Executive Director or their 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 February 12,2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

IMPORTANT: New Agreement # to be completed by Contracts, Grants, and Loans Office.

New Agreement Number: EPC-24-034

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Dustin Davis
3. MS-:51
4. Phone Number: 916-343-8542

C. Recipient's Information

1. Recipient's Legal Name: The Regents of the University of California, on behalf of the Davis Campus
2. Federal ID Number: 94-6036494

D. Title of Project

Title of project: Powering Yolo Forward: A Collaborative VPP Project for Demand Flexibility & Community Engagement

E. Term and Amount

1. Start Date: 2/24/2025
2. End Date: 3/29/2030
3. Amount: $5,000,000.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 2/12/2025 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Dustin Davis
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:
The Regents of the University of California, on behalf of the Davis Campus. Proposed resolution approving agreement EPC-24-034 with The Regents of the University of California, on behalf of the Davis Campus (UCD) for a $5,000,000 grant, and adopting staff's recommendation that this action is exempt from CEQA. This agreement will create a virtual power plant (VPP) as a collaborative initiative among three public entities in Yolo County: the Yolo County government, the City of Davis government, and UCD, along with an established VPP operator. The VPP will manage cooling demand at the community level to reduce peak electrical demand on hot summer days.(EPIC funding) Contact: Dustin Davis

G. California Environmental Quality Act (CEQA) Compliance

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

   If yes, skip to question 2.

If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a "Project":

Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because:

2. **If Agreement is considered a "Project" under CEQA answer the following questions.**

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

If yes, list CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

CCR section number: Cal. Code Regs., tit. 14, § 15301 ;

Common Sense Exemption? 14 CCR 15061 (b) (3)
No

If yes, explain reason why Agreement is exempt under the above section. If no, enter "Not applicable" and go to the next section.

Cal. Code Regs., tit. 14, Section 15301 provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public and 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 (CEQA). This project will consist of installing monitor devices, hardware, and/or software that will optimize the energy use related to heating, ventilation, and air conditioning. Therefore, the project will not have a significant environmental impact and is exempt under Section 15301.

Additionally, the project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project site is not included on any list compiled pursuant to Government Code section 65962.5; and the project will not cause a substantial adverse change in the significance of a historical

resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.

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

No

If yes, answer yes or no to all that applies. If no, list all as "no" and "None" as "yes".

Additional Documents	Applies
Initial Study	No
Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. Is this project considered "Infrastructure"?

No

I. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter "No subcontractors to report" and "0" to funds. **Delete** any unused rows from the table.

Subcontractor Legal Company Name	CEC Funds	Match Funds
City of Davis	$ 400,000	**$**100,000
Olivine, Inc.	$ 673,217	**$**273,304
TRC Engineers, Inc.	$ 643,043	**$**0
County of Yolo	$ 400,000	**$**200,000
TBD - Contractor	$ 60,000	**$**0
TBD - Contractor	$ 55,839	**$**0
TBD 1	$ 49,744	**$**0
TBD 2	$ 59,394	**$**0

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter "No vendors or sellers to report" and "0" to funds. **Delete** any unused rows from the table.

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
TBD - Controls	$30,000	$0
TBD Controls Contractor	$15,000	$0

K. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter "No key partners to report." **Delete** any unused rows from the table.

Key Partner Legal Company Name
No key partners to report

L. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter "N/A" for "Not Applicable" and "0" to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	23-24	301.001K	$ 5,000,000

TOTAL Amount: $ 5,000,000

R&D Program Area: ICMB: IAW

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #:

M. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Assigned Analyst

Address: 1 Shields Ave

City, State, Zip: Davis, CA 95616-5270

Phone: 530-754-7700

E-Mail: awards@ucdavis.edu

3. Recipient's Project Manager

Name: Caton Mande

Address: 215 Sage St Ste 100

City, State, Zip: Davis, CA 95616-7379

Phone: 530-752-1789

E-Mail: cwmande@ucdavis.edu

N. Selection Process Used

There are three types of selection process. List the one used for this GRF.

Selection Process	Additional Information
Competitive Solicitation #	GFO-23-309
First Come First Served Solicitation #	Not applicable
Other	Not applicable

O. Attached Items

1. List all items that should be attached to this GRF by entering “Yes” or “No”.

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	No
5	Awardee CEQA Documentation	No

Approved By

Individuals who approve this form must enter their full name and approval date in the MS Word version.

Agreement Manager: Dustin Davis

Approval Date: 11/22/2024

Branch Manager: Cody Taylor

Approval Date: 12/4/2024

Director: Cody Taylor for Jonah Steinbuck

Approval Date: 12/4/2024

Exhibit A
Scope of Work
The Regents of the University of California
on behalf of the Davis campus

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Education and community outreach
3	X	Enrollment of Assets for Community VPP Participation
4		SPARC-DR for RTUs
5		SPARC-DR for Chiller Plants
6	X	Community VPP Demonstration
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
API	Application Programming Interface
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
MPC	Model Predictive Control
RTU	Rooftop Unit
SPARC-DR	Scalable Predictive Automated Real-time Control for Demand Response
TAC	Technical Advisory Committee
UCD	University of California, Davis
VPP	Virtual Power Plant
WCEC	Western Cooling Efficiency Center

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

A. Purpose of Agreement

The Recipient will lead this effort to create a community-based virtual power plant (Community VPP) as a collaborative initiative among three public entities in Yolo County: the Yolo County government, the City of Davis government, and the University of California, Davis (UCD) campus, along with an established VPP operator. The VPP will manage cooling demand at the community level, which accounts for about 50% of California's peak electrical demand on hot summer days.

[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
The Regents of the University of California
on behalf of the Davis campus

B. Problem/ Solution Statement

Problem

Cooling demand is expected to increase as climate change results in more severe heat waves in California. The goal of this project is to develop, demonstrate, and disseminate a Community VPP that can be used as a model and scaled to similar communities in California. VPPs have the potential to support rapid electrification in California by shifting the focus of grid development from increasing generation capacity and improving infrastructure to recruiting grid participants to manage existing distributed energy resources (DERs). The Department of Energy estimates that by 2035, power capacity will need to be increased by 400 GW to meet peak demand and renewable energy targets. VPPs can reduce the increased capacity required by aggregating curtailable loads. However, their impact is limited by their use of one-way communications and rule-based control methods that do not optimize the operation of specific types of cooling systems. Additionally, large-scale aggregation does not take into consideration the specific dynamics of the localized grid.

Solution

This project will create, demonstrate, and disseminate a Community VPP that can be used as a model and scaled to similar communities in California. We will develop a scalable predictive automated real-time control for demand response (SPARC-DR) platform with two-way VPP communication. SPARC-DR will manage the electrical demand of cooling systems for commercial buildings to provide VPP benefits while maintaining occupant comfort and require minimal consumer engagement during operation. Community VPP is a local project with statewide impact. We will leverage the UCD campus' expertise in sustainability to educate local government leaders who will in turn share knowledge with their peers across the state.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Develop and evaluate a community-based VPP capable of delivering 2 - 10 MW of load reduction capacity during the utility's annual peak demand hour.
- Reduce net energy costs for government and university entities by optimizing energy use and participating in demand response programs using the VPP.
- Increase community awareness of the changing electric grid, the role of DERs, and the importance of grid sustainability.
- Develop a scalable methodology for a VPP that may be adopted by other government entities to contribute to broader decarbonization efforts.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of greater electricity reliability and lower costs by reducing the operation of VPP assets during peak grid demand hours. Shifting load out of these hours will directly result in reduced electricity cost for the ratepayers enrolled in the VPP. Peak load reduction smooths the electricity demand curve,

[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).

reducing reliance on fossil-fueled peaker plants and thereby lowering GHG emissions. Additionally, the introduction of the VPP improves grid stability and reliability. The benefits of lower GHG emissions and a more stable grid extend to all ratepayers, not just those directly enrolled in the VPP.

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 developing advanced control strategies using model predictive control (MPC) for optimizing the operation of assets enrolled in Community VPP and the SPARC-DR platform. SPARC-DR will enable the rapid and scalable setup and configuration of assets enrolled in the Community VPP and two-way communication with the VPP operator. The main advancement of SPARC-DR is that the MPC automatically controls cooling system operation based on occupant comfort requirements, equipment and building information, and external factors (weather, electricity cost, GHG emission, and DR events).

Additionally, the team will develop educational programs and materials to inform project stakeholders and the broader community about VPPs and distributed energy resources (DERs), their role in helping California reach its grid decarbonization goals, and how progress towards those goals benefits the community. UCD campus, City of Davis, and Yolo County leaders will "lead by example" and share their experiences with counterparts at other campuses and municipal governments throughout California through conferences and workshops.

Agreement Objectives

The objectives of this Agreement are to:

1. Develop VPP technology for cooling load management: The team will develop technology to manage the electrical demand of cooling systems for commercial buildings to provide VPP benefits while maintaining occupant comfort. The team will design and implement two-way communications with the VPP, sharing equipment-level information about the VPP assets to improve decision making. The two-way communication and operation of the VPP assets will be managed by the SPARC-DR platform, to be developed as an extension of the automated and predictive control framework and platform that WCEC developed for residential heat pumps under EPC-19-015.
2. Implement Community VPP demonstration: Community VPP will reduce load across the UCD campus, City of Davis, and Yolo County by 2 to 10 MW during the annual peak demand hour.
3. Implement community education and outreach: The team will develop educational programs and materials to inform project stakeholders and the broader community about VPPs and distributed energy resources (DERs), their role in helping California reach its grid decarbonization goals, and how progress towards those goals benefits the community.
4. Create Community+ VPP: The team will expand Community VPP's impact by creating a secondary program called "Community+ VPP." This program, run by an established VPP operator, will enable residential and commercial customers in Yolo County to opt-in to VPP participation to reduce electricity costs and contribute to grid stability. This low-barrier approach to demand response will empower the broader Yolo County community to

[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.

contribute to California's clean energy future and create a model for other communities to do the same.

5. Recover 20% of the total project budget by year 4.

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 1973UCD, 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**

- 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, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in 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., Teams, Zoom), with approval of the CAM.

The Kick-off meeting will include discussion of the following:
- The CAM's expectations for accomplishing tasks described in the Scope of Work;
- An updated Project Schedule;
- Terms and conditions of the Agreement;
- Invoicing and auditing procedures;
- Travel;
- Equipment purchases;
- Administrative and Technical products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Monthly Calls (subtask 1.5)
- Quarterly Progress reports (subtask 1.6)
- Final Report (subtask 1.7)
- Match funds (subtask 1.8);
- Permit documentation (subtask 1.9);
- Subawards(subtask 1.10);
- Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
- Agreement changes;
- Performance Evaluations; 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 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 may 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 may 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. A determination of unsatisfactory progress This may result in project delays, including a potential Stop Work Order, while the CEC determines whether the project should continue.
- 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(s)
- 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.

  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 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* organized by the tasks in the Agreement.

Products:

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

MONTHLY CALLS, REPORTS AND INVOICES

Subtask 1.5 Monthly Calls

The goal of this task is to have calls at least monthly between the CAM and Recipient to verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.

The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted or the CAM determines that a monthly call is unnecessary.

The CAM shall:

- Schedule monthly calls.
- Provide questions to the Recipient prior to the monthly call.

- Provide call summary notes to Recipient of items discussed during call.

The Recipient shall:

- Review the questions provided by CAM prior to the monthly call
- Provide verbal answers to the CAM during the call.

Product:

- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly 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 *Quarterly 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 reporting period, 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. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: https://www.energy.ca.gov/media/4691
- Submit a monthly or quarterly *Invoice* on the invoice template(s) provided by the CAM.

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:

- Invoice template

Subtask 1.7 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. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.7.1 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)

Exhibit A
Scope of Work
The Regents of the University of California
on behalf of the Davis campus

CAM Products:

- Energy Commission Style Manual
- Comments on Draft Final Report Outline
- Acceptance of Final Report Outline

Subtask 1.7.2 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 on Draft Final Report* 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 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 on Draft Final Report
- Draft Final Report
- Written Responses to Comments *(if applicable)*
- Final Report

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CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBAWARDS

Subtask 1.8 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. 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 application 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 application 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.
- 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 1.9 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 1.10 Subawards and Agreements with Site Hosts
The goals of this subtask are to: (1) procure subawards and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subawards are consistent with the terms and conditions of this Agreement and the Recipient's own procurement and contracting policies and procedures.

The Recipient shall:

- Execute, manage and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Execute and manage site host agreements and ensure the right to use the project site throughout the term of the Agreement, as applicable. A site host is not required if the Recipient is the site host.

- Notify the CEC in writing immediately, but no later than five calendar days, if there is a reasonable likelihood the project site cannot be acquired or can no longer be used for the project.
- Incorporate this Agreement by reference into each subaward.
- Include any required Energy Commission flow-down provisions in each subaward, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subaward terms.
- If requested by the CAM, submit a draft of each *Subaward* and any site host agreement required to conduct the work under this Agreement.
- If requested by the CAM, submit a final copy of each executed subaward and any site host agreement.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the terms regarding of subrecipient additions in the terms and conditions).

Products:

- Subawards and Site Host Agreement *(if requested by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 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.
- 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 1.12.
- 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 1.12 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.

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 1.13 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 section of 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.

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Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

Exhibit A
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on behalf of the Davis campus

IV. TECHNICAL TASKS

TASK 2 EDUCATION AND COMMUNITY OUTREACH

The goal of this task is to educate members of the Yolo County and City of Davis governments, UCD Facilities, and local communities about load flexibility, electrification, the benefits of participating in a VPP program, and how it supports the State's decarbonization goals. This goal will be achieved through a combination of workshops/seminars, disseminating initial/interim/final project findings with stakeholders, preparing project information (print and/or digital) to share with each community participating in the project, and project showcases to facilitate sharing project results with project partner's regional peers and stakeholders.

Subtask 2.1: Workshops/Seminars

The goal for this subtask is to educate key personnel of project partners, regional peers of key personnel, employees of project partners, local/regional non-profit stakeholders, committee/panel/advisory body, and local government councils about demand flexibility, electrification, and the project through workshops/seminars.

The Recipient shall:

- Coordinate and run annual workshops/seminars to educate project partners and stakeholders about demand flexibility, electrification, and the project
- Workshop/seminar materials will initially be tailored specifically for key personnel of project partners. Each year, these materials will be expanded and adapted to accommodate a broader audience, like employees of project partners, regional peers, non-profit stakeholders, committee/panel/advisory body, and local government councils.
- Workshops/seminars will include at least two parts: focused education on fundamental topics related to demand flexibility/VPPs, and second, question-and-answer time to address questions, concerns, or feedback from the group related to the project and implementing a VPP at their respective entity.
- Record the education portion of the event to make the resource available to project partners, stakeholders and the community.
- Prepare workshop/seminar section for annual memo "*VPP Education and Community Outreach, Project Year [1/2/3]*" that includes summary information about the events, topics, and attendees for each year of the project.

Subtask 2.2: Disseminate Project Findings at Relevant Stakeholder Organization Meetings, Events or Conferences

The goal for this subtask is to disseminate initial/interim/final project findings at functions hosted by stakeholder organizations. Project team members will plan to travel to these events to engage with stakeholders in their usual settings, which can improve communication effectiveness and reach a broader audience.

The Recipient shall:

- Identify relevant stakeholder organization meetings, events or conferences to share project findings.
- Once available, disseminate initial/interim project results by traveling to these events to engage stakeholders in their usual settings, ensuring effective communication and feedback on project findings.

- Prepare relevant stakeholder engagement section for annual memo "*VPP Education and Community Outreach, Project Year [1/2/3]*" that includes summary information about the events and the project findings shared.

Subtask 2.3: Prepare and Distribute Print or Digital Information to the Communities and Host Project Showcases

The goal of this subtask is to prepare and distribute information for each community, in coordination with the county, city, and campus. This subtask also includes hosting project showcases to share project findings with regional peers and stakeholders and allow them to see parts of the project in person.

The Recipient shall:

- Prepare project information (print and/or digital) to share with each community in coordination with the county, city, and campus.
- Host final project showcase to share results with the community, regional peers and stakeholders.
- Prepare section for annual memo "*VPP Education and Community Outreach, Project Year [1/2/3]*" that includes details about the informational materials shared with the community and highlights from each project showcase.
- Prepare Task 2 Report "*Community VPP Education and Community Outreach*" that includes details about educational events and topics covered, stakeholder events and discussions based on project result presentations, and project information for the community.

Products:

- Memo on VPP Education and Community Outreach, including copies of educational resources created in Subtask 2.1, Project Year 1
- Memo on VPP Education and Community Outreach, Project Year 2
- Memo on VPP Education and Community Outreach, including copies of educational resources created in Subtask 2.1, Project Year 3
- Task 2 Report "Community VPP Education and Community Outreach" (draft and final)

TASK 3 ENROLLMENT OF ASSETS FOR COMMUNITY VPP PARTICIPATION

The goal of this task is to work with project team members from Yolo County General Services, City of Davis Public Works and Utilities, and the UCD Campus Facilities team to identify, select, and enroll existing rooftop units (RTUs) and chillers in Community VPP. This task will also include any required modifications or procurement and installation of new control systems to enable RTUs and chillers to enroll in Community VPP, which will depend on the needs of the VPP operator.

Subtask 3.1: Identify and Select Assets

The goal of this subtask is to work with project partners from Yolo County, City of Davis, and UC Davis Campus to identify viable RTUs and chillers for Community VPP and select assets based on a criterion that includes assets based on equipment capacity, details about the building/zone served by the equipment, expected/typical runtime during peak hours, and need for control system modifications.

The Recipient shall:

- Compile a list of existing and viable RTUs and/or chillers that could be VPP assets from:
  - UCD Campus
  - City of Davis
  - Yolo County
- Assess the current control and metering infrastructure and determine the need for control upgrades, additional hardware, or firmware/software updates from the original equipment manufacturer.
- Develop an asset selection criterion that includes equipment capacity, building/zone use type, expected/typical runtime during peak hours, and need for control system modifications to determine suitability for enrollment in the Community VPP.
- Select assets for Community VPP from Yolo County, City of Davis, and UCD Campus based on the selection criterion described above and input from project team members.

Subtask 3.2: Control System Changes and VPP Enrollment

The goal for this subtask is to determine the control system needs for each project partner, based on Subtask 3.1. Existing control systems will be modified, or new systems will be procured and installed, based on requirements for Community VPP enrollment and project partner's development roadmaps. Finally, the selected RTUs and chillers will be enrolled in Community VPP.

The Recipient shall:

- Identify the need for project partners to procure and install new controls systems or modify existing controls systems to enroll in Community VPP, based on findings from Subtask 3.1.
- Coordinate and support control system modification, if needed, with each project partner and their existing control contractor or in-house support team.
- Specify explicit control requirements and coordinate with project partners as they prepare the required documents to procure and install a new system through a bidding process.
- Coordinate with the VPP operator project partner to develop new or modify existing VPP agreements based on the equipment and specific requirements for Yolo County, City of Davis, and the UCD Campus.
- Enroll selected RTUs and chillers in Community VPP, in coordination VPP operator project partner.
- Produce a memo "C*ommunity VPP Equipment Schedule and Required Control Procurement and Installation or Modifications*", which will include a list of all building assets enrolled in Community VPP, their locations, and mechanical specifications. It will also include details from each project partner that needed to modify existing or procure and install new control systems.
- Prepare *CPR Report #1* and participate in CPR meeting in accordance with subtask 1.3.

Products:

- Memo on the Community VPP Equipment Schedule and Required Control Procurement and Installation or Modifications
- CPR Report #1

Exhibit A
Scope of Work
The Regents of the University of California
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TASK 4 SPARC-DR FOR RTUS

The goal of this task is to enhance UCD's SPARC-DR platform with four new components: establishing two-way communication between the platform and the VPP operator, integrating with commercial building control system APIs to communicate setpoint changes and building data, developing predictive modeling approaches for the RTUs enrolled in the Community VPP, and implementing advanced control strategies to optimize RTU performance for Community VPP.

Subtask 4.1 Background research and SPARC-DR platform integration

The goal of this subtask is to conduct background research on the integration of SPARC-DR with building control system APIs and two-way communication between the SPARC-DR and the VPP operator.

The Recipient shall:

- Conduct background research on the integration of SPARC-DR with building control system APIs.
- Augment the SPARC-DR platform for building control system data collection and storage, including control of building space conditioning setpoints.
- Develop a standardized hierarchical tree data structure that describes the top-down relationships of Community VPP, the buildings with RTUs participating in the VPP, and the collected data.
- Develop an automated tool set for setup and configuring Community VPP, including establishing two-way communication for SPARC-DR to VPP operator and SPARC-DR to building control system.
- Prepare a memo "*Integration of Rooftop Units in Community VPP with the SPARC-DR Platform*" which will include key findings, challenges or limitations from the background research, a summary of the enhancements made to the SPARC-DR platform for building data collection, storage, and control of building space conditioning setpoints, and a description of the tree data structure.

Subtask 4.2 Rule-based SPARC-DR Approach

The goal of this subtask is to develop, implement, integrate, and test a rule-based SPARC-DR approach for setting space conditioning setpoints of participating RTUs.

The Recipient shall:

- Develop an annual ("8760 hour") model of building spaces conditioned by RTUs.
- Develop and deploy the SPARC-DR approach for load shedding, load shifting, and participation in DR events during RTU cooling operation and reducing demand during the annual peak demand hour.
- Conduct simulation-based testing of control methodology.
- Integrate the rule-based control approach with the SPARC-DR platform.
- Prepare memo "*Rule-based SPARC-DR Approach for RTU Participation in Community VPP*" which will include a description of the 8760 model for building spaces conditioned by RTUs, a summary of the SPARC-DR approach for load shedding, load shifting, and participation in DR events during RTU cooling operation and reducing demand during the annual peak demand hour, and initial simulation testing results.

Subtask 4.3 Optimization-based SPARC-DR Approach

The goal of this subtask is to develop, implement, integrate, and test an optimization-based SPARC-DR approach for setting space conditioning setpoints of participating RTUs.

The Recipient shall:

- Develop a building predictive modeling approach to predict average building indoor conditions, total building cooling demand, total building power consumption, and DR event (as applicable) in response to space conditioning setpoints, ambient conditions and other relevant factors (e.g., time of the day and day type).
- Develop the SPARC-DR for RTUs, incorporating the predictive models, to determine space conditioning setpoints as a function of time to meet performance requirements, define as:
    - Ensure indoor conditions are comfortable
    - Minimize net operating cost for space condition systems by load shedding, load shifting, and participation in DR events
    - Reduce peak load during utility's peak demand hour
- Conduct simulation-based testing of control methodology.
- Integrate the control methodology with the SPARC-DR.
- Prepare memo "*Optimization-based Scalable Predictive Automated Real-time Control for Demand Response Approach for RTU Participation in Community VPP*" which will include a summary of the predictive modeling approach to predict average building indoor air conditions, total building cooling demand, and total building power consumption, details of SPARC-DR for RTUs development, and initial simulation testing results.
- Prepare a Task 4 Report "*Scalable Predictive Automated Real-time Control for Demand Response Approaches for RTU Participation in Community VPP*" that includes a summary of the background research, the predictive control approaches, simulation testing results, and the automated tool set for setup and configuring Community VPP.

Products:

- Memo on the Integration of Rooftop Units in Community VPP with the SPARC-DR Platform
- Memo on the Rule-based SPARC-DR Approach for RTU Participation in Community VPP
- Memo on the Optimization-based SPARC-DR Approach for RTU Participation in Community VPP
- Task 4 Report on Scalable Predictive Automated Real-time Control for Demand Response Approaches for RTU Participation in Community VPP (draft and final)

TASK 5 SPARC-DR FOR CHILLER PLANTS

The goal of this task is to augment the UCD Chiller Plant's predictive optimization system with two-way communication to the VPP operator and develop enhancements to the optimization system to automate participation of the chiller plant in the Community VPP.

Subtask 5.1 Background Research

The goal of this subtask is to conduct background research on the possible DR programs that a UCD Chiller Plant can participate in and select the programs that will be considered for the demonstration (Task 6).

The Recipient shall:

- Conduct background research on the integration SPARC-DR with UCD Chiller Plant.
- Conduct background research into DR programs for UCD Chiller Plant.
- Select programs to participate in for the demonstration.
- Prepare a memo "*Background Research on Participation of a Chiller Plant in a VPP"* which will include a summary of the background research for SPARC-DR integration and DR programs for UCD Chiller Plant, and details about the programs that will be used during the demonstration.

Subtask 5.2 Augment Chiller Plant Optimization for Automating Participation in DR Programs

The goal of this subtask is to augment the UCD Chiller Plant's optimization system to automate the participation in DR programs.

The Recipient shall:

- Establish two-way communication between SPARC-DR for Chiller Plants and VPP operator.
- Augment optimization system to automate participation of UCD Chiller Plant in DR programs.
- Simulation-based testing with existing annual 8760-hour UCD Chiller Plant model with and without participation in DR programs.
- Prepare memo "*SPARC-DR Approach for Chiller Plant Participation in Community VPP*" which will include a description of the two-way communication method between SPARC-DR for Chiller Plants and VPP operator, details on optimization system changes to automate participation in DR programs, and initial simulation testing results.
- Prepare a Task 5 Report "*Scalable Predictive Automated Real-time Control for Demand Response Approach for Chiller Plant Participation in Community VPP*" that includes a summary of the background research, the predictive control methodology, and simulation testing results.

Products:

- Memo on the Background Research on Participation of a Chiller Plant in a VPP
- Memo on the SPARC-DR Approach for Chiller Plant Participation in Community VPP
- Task 5 Report on Scalable Predictive Automated Real-time Control for Demand Response Approach for Chiller Plant Participation in Community VPP (draft and final)

TASK 6 COMMUNITY VIRTUAL POWER PLANT DEMONSTRATION

The goal of this task is to demonstrate the effectiveness and performance of Community VPP using the enrolled assets of Yolo County, City of Davis, and UCD Campus. The demonstration will be broken into three phases. For the first two phases, the Community VPP will operate as three independent VPPs (i.e. Yolo Community VPP, Davis Community VPP, and UCD Campus Community VPP). In phase three, a cooperative approach will be investigated, where all the assets will be combined into a single county-wide Community VPP and the performance will be compared to non-cooperative results from the first two phases.

In addition to the Community VPP, the team will expand Community VPP's impact by creating a secondary program called "Community+ VPP." This program, run by the VPP operator, will

enable residential and commercial customers in Yolo County to opt-in to VPP participation to reduce electricity costs and contribute to grid stability. Customers will be notified of grid events and have the option to manually and/or automatically (using connected devices) shed load to contribute to grid stability during events in exchange for compensation. This low-barrier approach to demand response will empower the broader Yolo County community to contribute to California's clean energy future and create a model for other communities to do the same.

Subtask 6.1: Phase 1 of Community VPP Demonstration
The goal for this subtask is to start the demonstration of the Community VPP demonstration using the controls developed in subtask 4.2 and 5.2 to assess the effectiveness and performance.

The Recipient shall:

- Lead site communications and planning
    - Prepare materials for UCD's Institutional Review Board to ensure protection of human subjects (i.e. building occupants) participating in research.
    - Manage communications and scheduling with Yolo County, the City of Davis, and UCD Campus.
    - Prepare a memo that describes the "*Phase 1 Community Virtual Power Plant Demonstration Plan",* which will include a description of
        - The monitoring and verification plan to assess Community VPP performance
        - Baseline approach that will be used to benchmark Community VPP performance based on VPP event type
        - The initial event types to trigger Community VPP participation
- Start the Community VPP demonstration with each project partner based on the needs to complete Subtask 3.2 Control System Changes and VPP Enrollment at each site, within Year 1 of the project.
- Occupant, maintenance staff, and building owner satisfaction
    - Collect survey feedback from building occupants, maintenance staff, and building owners on satisfaction with controls, user interface, and comfort before and after enrollment in VPP.
    - Prepare a memo "*Phase 1 Community VPP Occupant, Maintenance Staff, and Building Owner Satisfaction"* that includes the feedback provided by these groups.
- Prepare a memo "*Community VPP Phase 1 Results*" which will include a summary of the total cost recovery, which can include: cost savings, new revenues, avoided costs, and other social environmental benefits as defined in the GFO-23-309 Solicitation Manual Attachment 12, an overview of events called by the VPP operator, and a breakdown of asset participation and reliability for Phase 1 of the Community VPP demonstration.
- Prepare *CPR Report #2* and participate in CPR meeting in accordance with subtask 1.3.

Subtask 6.2 Start Community+ VPP
The goal of this subtask is to expand Community VPP's impact by creating a secondary program called "Community+ VPP." This program, run by the VPP operator, will enable residential and commercial customers in Yolo County to opt-in to VPP participation to reduce electricity costs and contribute to grid stability.

The Recipient shall:

- Help facilitate enrollment of interested residential or commercial customers in Community+ VPP with the project's VPP operator.
- Prepare annual memo "*Community+ VPP Enrollment and Participation Statistics [1/2/3]*" that will include basic information about newly enrolled customers and information about Community+ VPP performance over the past year.

Subtask 6.3: Phase 2 of VPP Demonstration

The goal for this subtask is to demonstrate the effectiveness and performance the Community VPP demonstration using the controls developed in Subtask 4.3 and 5.2.

The Recipient shall:

- Update RTU to the predictive and automated control developed in Subtask 4.3
    - Switch RTUs enrolled from Yolo County, City of Davis, and UCD Campus to use the new predictive and automated control method for updating setpoints
    - Monitor data to determine if the control update is working as expected and correct issues as they occur
    - Prepare a memo that discusses "*Predictive and Automated RTU control update for Community VPP",* which will include a summary of the control update process, summary of troubleshooting data review, and preliminary results from at least one Community VPP event with the new control method.
- Occupant, maintenance staff, and building owner satisfaction
    - Collect survey feedback from building occupants, maintenance staff, and building owners on satisfaction with controls, user interface, and comfort before and after enrollment in VPP.
    - Prepare a memo "*Phase 2 Community VPP Occupant, Maintenance Staff, and Building Owner Satisfaction"* that includes the feedback provided by these groups.
- Prepare a memo on "*Community VPP Phase 2 Results"* which will include a summary of the total cost recovery, which can include: cost savings, new revenues, avoided costs, and other social environmental benefits as defined in the GFO-23-309 Solicitation Manual Attachment 12, an overview of events called by the VPP operator, a breakdown of asset participation and reliability. This memo will detail Phase 2 results and cumulative outcomes to date.

Subtask 6.4 Control Enhancements Cooperative County-Wide Community VPP

The goal of this subtask is to assess the holistic benefits of the three local governments collectively operating Community VPP as opposed to doing so individually. The team will identify, develop, and test control enhancements based on findings from subtask 6.1 and 6.3. Enhancements that will be considered include, the expansion of the VPP to other UCD Chiller Plant assets that will be installed and commissioned during the project, optimization function modifications, cross communication/integration between the community VPP control systems deployed in Subtasks 6.1 and 6.3.

The Recipient shall:

- Identify opportunities for control enhancements for achieving cooperation amongst the community VPPs based on the data collected in Subtask 6.1 and 6.3.

- Implement predictive control enhancements for participation in a cooperative county-wide VPP.
- Perform simulation-based testing with annual 8760 hour model(s) with and without participation.
- Prepare a memo on "*Control Enhancements for Cooperative County-Wide VPP*" that includes a summary of identified opportunities for control enhancements, the developed predictive control enhancements, and simulation testing results.

Subtask 6.5: Phase 3 of VPP Demonstration

The goal for this subtask is to demonstrate the effectiveness and performance of Community VPP operating as a single county-wide Community VPP. For this part of the demonstration, Community VPP will operate using the controls developed in subtask 4.4 and 5.3. The performance of the cooperative Community VPP operation will be compared to the performance from Subtask 6.1 and Subtask 6.3.

The Recipient shall:

- Update RTU and chiller controls to use predictive, automated, and cooperative control methods developed in Subtask 4.4 and 5.3
    - Switch all assets enrolled from Yolo County, City of Davis, and UCD Campus to use the new predictive, automated, and cooperative control method for updating setpoints.
    - Monitor data to determine if the control update is working as expected and correct issues as they occur.
    - Prepare a memo that discusses *"Cooperative control update for Community VPP",* which will include a summary of the control update process, summary of troubleshooting data review, and preliminary results from at least one Community VPP event with the new control method.
- Occupant, maintenance staff, and building owner satisfaction
    - Collect survey feedback from building occupants, maintenance staff, and building owners on satisfaction with controls, user interface, and comfort before and after enrollment in VPP.
    - Prepare a memo "*Occupant, Maintenance Staff, and Building Owner Satisfaction"* that includes the feedback provided by these groups.
- Prepare Task 6 Report "*Community VPP Results, Learnings, and Recommendations" w*hich summarizes the energy and non-energy results for the Community VPP from phase 1, 2, and 3.
- Prepare a memo on "*Project Net Benefits"* which will include the details for Community VPP's total cost recovery, based on cost savings, new revenues, avoided costs, and other social environmental benefits as defined in the GFO-23-309 Solicitation Manual Attachment 12.

Products:

- Memo on the Community Virtual Power Plant Demonstration Plan
- Memo on the Community VPP Phase 1 Results
- Memo on the Community VPP Phase 2 Results
- Memo on Community+ VPP Enrollment and Participation Statistics, Project Year 1

- Memo on Community+ VPP Enrollment and Participation Statistics, Project Year 2
- Memo on Community+ VPP Enrollment and Participation Statistics, Project Year 3
- Memo on the Phase 1 Community VPP Occupant, Maintenance Staff, and Building Owner Satisfaction
- Memo on the Phase 2 Community VPP Occupant, Maintenance Staff, and Building Owner Satisfaction
- Memo on the "Control Enhancements for Cooperative County-Wide VPP"
- CPR Report #2
- Task 6 Report "Community VPP Results, Learnings, and Recommendations*"* (draft and final)
- Memo on "Project Net Benefits"

TASK 7: 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' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st 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 on the Energize Innovation website (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 directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund

Exhibit A
Scope of Work
The Regents of the University of California
on behalf of the Davis campus

- Documentation of Organization Profile on EnergizeInnovation.fund

Exhibit A
Scope of Work
The Regents of the University of California
on behalf of the Davis campus

TASK 8 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the technological learning that resulted from the demonstration(s) is captured and disseminated to the range of professions that will be responsible for future deployments of this technology or similar technologies.

The Recipient Shall:

- Develop and submit a *Project Case Study Plan* that outlines how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The Project Case Study Plan should include:
    - An outline of the objectives, goals, and activities of the case study.
    - The organization that will be conducting the case study and the plan for conducting it.
    - A list of professions and practitioners involved in the technology's deployment.
    - Specific activities the recipient will take to ensure the learning that results from the project is disseminated to those professions and practitioners.
    - Presentations/webinars/training events to disseminate the results of the case study.
- Present the draft *Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the draft *Project Case Study 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 *Project Case Study Plan* to the CAM for approval.
- Execute the final Project Case Study Plan and develop and submit a Project Case Study.
- When directed by the CAM, develop presentation materials for a CEC sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- 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:

- Project Case Study Plan (draft and final)
- Summary of TAC Comments
- Project Case Study (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Exhibit A
Scope of Work
The Regents of the University of California
on behalf of the Davis campus

Please see the attached Excel spreadsheet.