California Energy Commission
October 08, 2025 Business Meeting
Backup Materials for Indian Energy LLC

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: 25-1008-XX

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Indian Energy LLC

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-25-029 with Indian Energy LLC for a $3,789,986 grant. This project will support the development and demonstration of an integrated microgrid and building orchestration system that co-optimizes energy use to enhance efficiency and grid resilience. Initial testing will be conducted at the Marine Corps Air Station Miramar microgrid testbed to evaluate real-world performance and implementation challenges. The system will then be deployed at the Viejas Enterprises Microgrid, located on the territory of the Viejas Band of Kumeyaay Indians near Alpine; 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 October 08, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kim Todd
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-25-029

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Hamidah Ross
3. MS-:N/A
4. Phone Number: N/A

C. Recipient's Information

1. Recipient's Legal Name: Indian Energy LLC
2. Federal ID Number: 27-1375128

D. Title of Project

Title of project: Resilient Decarbonized Microgrids Through Optimal Control of Distributed Energy Resources and Loads

E. Term and Amount

1. Start Date: 10/31/2025
2. End Date: 8/31/2028
3. Amount: $3,789,986.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 10/8/2025 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Ayat Osman
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Electric Program Investment Charge (EPIC)

Agenda Item Subject and Description:

INDIAN ENERGY LLC. Proposed resolution approving agreement EPC-25-029 with Indian Energy LLC for a $3,789,986 grant, and adopting staff's recommendation that this action is exempt from CEQA. This project will support the development and demonstration of an integrated microgrid and building orchestration system that co-optimizes energy use to enhance efficiency and grid resilience. Initial testing will be conducted at the Marine Corps Air Station Miramar microgrid testbed to evaluate real-world performance and implementation challenges. The system will then be deployed at the Viejas Enterprises Microgrid, located on the territory of the Viejas Band of Kumeyaay Indians near Alpine. (EPIC funding) Contact: Ayat Osman

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":

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 ; Cal. Code Regs., tit. 14, § 15306 ;

   Common Sense Exemption? 14 CCR 15061 (b) (3)
   Yes
   If yes, explain reason why Agreement is exempt under the above section. If no, enter "Not applicable" and go to the next section.

   MARINE CORPS AIR STATION MIRAMAR LOCATION:

   Cal. Code Regs., tit. 14, sect. 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 existing or former use at the time of the lead agency's determination, are categorically exempt from the provisions of the California Environmental Quality Act (CEQA). The proposed project will consist of developing testing and data collection for an Integrated Microgrid and Building Orchestration and Optimization system software, aimed at improving microgrid resiliency. These activities are limited to software testing, monitoring, and research documentation within existing facilities and will not require new construction or physical modifications This project will result in negligible or no expansion of use beyond that already existing and is also subject to a National Environmental Policy

Act (NEPA) categorical exclusion related to existing federal facilities. Therefore, the project falls within section 15301 and will not have a significant effect on the environment.

Cal. Code Regs, tit. 14, sec. 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. The proposed project consists of collecting and analyzing operational data from the existing microgrid assets at MCAS Miramar, including building loads, distributed energy resources, batteries, and HVAC systems, to evaluate performance of the optimization software; conducting measurement and verification activities; preparing technical reports such as energy audits, pre-optimization analyses, and building performance evaluations; and developing paper studies and models to support future scalability and value assessment. These activities are limited to software testing, monitoring, and research documentation within existing facilities and will not require new construction or physical modifications. Therefore, the proposed project falls within section 15303 and will not have a

This project does not involve impacts on any particularly sensitive environment; 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; 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 sites are 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.

VIEJAS BAND OF KUMEYAAY INDIANS LOCATION:

This project is covered by the Common Sense Exemption under Cal. Code Regs., tit. 14, sect. 15061 (b) (3) that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.

This project will take place on tribal land, but off-reservation impacts must still be evaluated under Government Code section 12012.101(b)(2), but this project is exempt under the “common sense” CEQA exemption because the proposed project will not:

- construct on or alter any off-reservation land;
- impact local air quality;
- use groundwater resources or otherwise impact any off-reservation water resources;
- build additional transportation infrastructure;

- generate additional traffic volumes;
- increase, once the project is complete, ambient noise beyond the existing commercial activities; or
- degrade the visual character or quality of off-reservation views, including those of scenic resources or objects of aesthetic significance.

The proposed project will consist of deploying the control orchestrator software on the existing Viejas Enterprises Microgrid, connecting microgrid assets and building loads to a cloud-based energy management platform, collecting and analyzing operational data, conducting measurement and verification activities, and preparing technical reports to evaluate system performance. All activities will be limited to the existing microgrid facilities and will involve only software integration, monitoring, and testing of equipment already in place. No new construction or expansion of facilities is required, and no work will occur outside of tribal lands. Compared with the current supply of energy, the proposed project will improve energy resiliency for Tribal facilities and the local electric grid, as well as reduce overall energy demand on the local energy provider and lower fossil fuel usage and greenhouse gas (GHG) emissions. Because the proposed project will improve air quality and reduce GHG emissions, and does not provide for any physical changes outside of the Indian reservation, it can be seen with certainty that there is no possibility that the proposed project may have a significant effect on the off reservation environment. Based on all these factors, the proposed project meets the CEQA “common sense” exemption.

The project does not involve impacts on any particularly sensitive environment; 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
United States Department of Energy (DOE) - Lawrence Berkeley National Laboratory (LBNL)	$ 1,026,323	**$**0
MELROK OPERATING, LLC	$ 2,041,529	**$**333,000

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
No vendors to report	**$0**	**$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	24-25	301.001L	$ 3,789,986

TOTAL Amount: $ 3,789,986

R&D Program Area: TIEB: EDMF

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #:

M. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Henry Boulley

Address: 7991 E Altair Ln

City, State, Zip: Anaheim, CA 92808-2201

Phone: 541-698-0153

E-Mail: hjboulley@indianenergy.com

2. Recipient’s Project Manager

Name: Michel Kamel

Address: 22600 Savi Ranch Pkwy Ste A10

City, State, Zip: Yorba Linda, CA 92887-4666

Phone: 949-466-7104

E-Mail: mkamel@melrok.com

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-23-318
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

Item Number	Item Name	Attached
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	Yes
5	Awardee CEQA Documentation	Yes

Approved By

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

Agreement Manager: Hamidah Ross

Approval Date: 8/26/2025

Branch Manager: Anthony Ng

Approval Date: 8/28/2025

Director: Jonah Steinbuck *(delegated to Branch Manager)*

Approval Date: n/a

Exhibit A
Scope of Work
Indian Energy, LLC

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Definition Of Use Cases, Control and Testing Specifications
3	x	Software Development and Testing in Simulation
4	x	Testing of New Strategies at the Microgrid Testbed
5		Testing at Field Site(s)
6		Scalability Analysis and Value Proposition of the Technology
7		Evaluation of Project Benefits
8		Technology/knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
BAS	Building Automation System
CAM	Commission Agreement Manager
CEC	California Energy Commission
CPR	Critical Project Review
CxR	Commissioning Report
DER	Distributed Energy Resources
EMIS	Energy Management Information System
EPIC	Electric Program Investment Charge
HVAC	Heating, ventilation, and Air Conditioning
M&V	Measurement and Verification
Recipient	Indian Energy LLC
RICU	Rapid Integration and Commercialization Unit
TAC	Technical Advisory Committee

[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
Indian Energy, LLC

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

A. Purpose of Agreement

The purpose of this Agreement is to support the development, demonstration, and commercialization of an Integrated Microgrid and Building Orchestration and Optimization System designed to improve energy efficiency, enhance grid resiliency, reduce greenhouse gas emissions, and lessen reliance on backup generators. By integrating with a cloud-based energy management information system (EMIS), the system will co-optimize building loads alongside distributed energy resources (DER).

This initiative builds upon previous awards from the California Energy Commission (CEC), including EPC-19-046, EPC-19-051, LDS-22-001, and LDS-23-002, along with a partial loan guarantee from the Department of Energy. These prior grants facilitated the establishment of a microgrid test facility at Marine Corps Air Station Miramar in San Diego County. Additionally, they contributed to the development of the Viejas Enterprises Microgrid, situated on the lands of the Viejas Band of Kumeyaay Indians, near Alpine, California.

For the purposes of this Agreement, initial assessments will take place at the existing microgrid testbed at the Marine Corps Air Station Miramar. This evaluation will demonstrate both the advantages and the obstacles associated with implementing the control orchestrator in a real-world setting, and it will assist in mitigating risks related to the technology before its deployment at the permanent field location at the Viejas Enterprises Microgrid. The intent is to further enhance the microgrid and storage product, aiming to create a scalable and replicable solution that will benefit California ratepayers by improving grid reliability and decreasing energy consumption.

B. Problem/ Solution Statement

Problem

Today's microgrids typically operate building loads and some DER in isolation from each other. The microgrid controller often only manages the DERs, missing opportunities to coordinate them with the building loads. Currently, building automation system (BAS) are not responsive to grid signals, which limits their ability to optimize energy use in real-time. Furthermore, to compensate for energy needs during blackouts, microgrids often rely on fossil-fueled generators, which undermines efforts to reduce carbon emissions and improve sustainability.

Solution

Leveraging recent advancements in advanced controls for buildings and DERs, this Agreement will develop and demonstrate an Integrated Microgrid and Building Orchestration and Optimization System. This technology aims to enhance the efficiency of building equipment and improve the resiliency of the microgrid, thereby reducing the reliance on backup generators and lowering carbon emissions. The innovation will enable the coordination of the microgrid and building systems under various modes of operation to sustain critical loads for as long as possible in islanded mode and to minimize emissions in grid-connected mode.

C. Goals and Objectives of the Agreement

Exhibit A
Scope of Work
Indian Energy, LLC

Agreement Goals

The goals of this Agreement are to:

- Formulate the specifications for the control orchestrator software, considering the energy loads specific to the sites, and ensure their integration with the cloud platform.
- Develop the software for the orchestrator and test the microgrid orchestrator in a simulation environment.
- Integrate the orchestrator into an EMIS platform.
- Confirm the project pilot sites and execute agreements to secure the sites.
- Test the integrated EMIS and orchestrator on a testbed and field sites.
- Demonstrate the ability of a new "Integrated Microgrid and Building Orchestration and Optimization System" to reduce cost and risk for a microgrid operator.
- Collect operational data to measure and verify that the project performance metrics are attained.
- Assess the scalability and demonstrate how this solution can be deployed across various contexts and landscapes.

Ratepayer Benefits:[2]

This Agreement is expected to deliver substantial benefits for the tribal ratepayers of Viejas Enterprises as well as all ratepayers by ensuring enhanced electricity reliability, lower costs, decreased greenhouse gas emissions, and improved safety. The community will gain from an on-site microgrid that features islanding capabilities, allowing for emergency power supply during outages. This Agreement will offer the following advantages:

- Benefits to tribal ratepayers
    - Provide low-cost electricity for the next 30 years through a power purchase agreement.
    - Lower carbon electricity, generated locally with renewable energy resources.
    - Provide a longer duration of battery storage in case of power outages.
- Benefit to other California ratepayers
    - Assist in achieving California's load shift targets of 7GW, as building-integrated microgrids will be able to react directly to grid signals.
    - Lead to further cost reduction of stationary storage for utilities.
    - Deferred costs for technology and infrastructure upgrades.
    - Enable the deployment of grid-flexible and building-integrated microgrid systems at scale throughout California.

Technological Advancement and Breakthroughs:[3] This Agreement will lead to technological advancement and breakthroughs in microgrid controls that can reduce carbon emissions and increase resilience for their customers. The public investment in this initiative will yield data

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

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

regarding feasibility and cost-effectiveness, as well as the performance of cloud-controlled microgrid systems in rural communities.

Agreement Objectives

The objectives of this Agreement are to:

- Extend the duration of critical service operation by 2 to 4 hours.
- Reduce runtime reliance on fossil-fuel backup generators by a minimum of 30%.
- Reduce the energy consumption of the microgrid-assisted building by a minimum of 15%.
- Reduce energy costs by managing building loads and DERs based on grid signals, such as wholesale electricity market bidding by a minimum of 5%.
- Identify relevant use-cases, target equipment to be controlled, and develop software specifications for a control software to coordinate microgrids, DERs, and BAS as a single system.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations**.** All technical tasks should include product(s). Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

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

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

- **Electronic File Format**
  - Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the CEC'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.

  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, (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 Commission Agreement Officer 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)

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

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 Obtain and Execute Subawards and Agreements with Site Hosts
The goals of this subtask are to: (1) procure and execute subrecipients and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subrecipients and site host agreements are consistent with the Agreement terms and conditions and the Recipient's own contracting policies and procedures.

The Recipient shall:

- Execute and manage subawards and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subaward.
- Include any required CEC 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.

- Submit a *Subaward and Site Letter* to the CAM describing the subawards and any site host agreement needed or stating that no subawards or site host agreements are required.
- 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 subrecipient additions in the terms and conditions).

Products:

- Subaward and Site Letter
- Draft Subawards (if requested by the CAM)
- Draft Site Host Agreement (if requested by the CAM)
- Final Subawards (if requested by the CAM)
- Final 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 ensure 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* for each TAC Meeting 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 ensure 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.

Products:
- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2: DEFINITION OF USE CASES, CONTROL, AND TESTING SPECIFICATIONS

The primary goal of this task is to identify the collection of assets that require operational optimization. This encompasses DERs and building systems within the existing microgrids managed by the Recipient, along with prospective new microgrids that may be developed in the future. The secondary goal is to establish the methodology for the improved optimization tool.

Subtask 2.1: Define Target Systems to be Optimized

The goal of this subtask is to identify the target assets that will be controlled by the EMIS and the control orchestrator, on both the building side and the microgrid side.

The Recipient shall:
- Identify candidate existing and future microgrid(s) to be considered, including but not limited to a microgrid testbed and the selected field sites.
- For existing microgrids:
    - Review existing equipment including but not limited to heating, ventilation, and Air Conditioning (HVAC) systems, environmental sensors, metering equipment, photovoltaic arrays, and batteries and buildings on-site.
    - Review mechanical drawings and controls submittals of current HVAC, DERs, and microgrid.
    - Coordinate with the site operators and identify a list of equipment that can be controlled, their nominal capacities, and their specifications.
    - Coordinate with the site operators and identify a list of zones and physical spaces that can be controlled and their details.
- For microgrids under construction or in planning stages:
    - Identify systems of interest and their specifications.
- Define use cases for optimization, such as load shift, price response, and extended islanding after planned and unplanned blackouts.
- Document the identified systems, equipment, sites, specifications, and the use cases that will be considered for this project in the *Target Systems for Optimization Technical Report,* which is 3-10 pages, will contain applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
    - A description of the identified target assets,
    - A description of the equipment and specifications,
    - A summary of the use cases and how they relate to EMIS and control orchestrator.

Products:
- Target Systems for Optimization Technical Report

Subtask 2.2: Preliminary Collection and Analysis of Buildings and Microgrid Data
The goal of this subtask is to collect and analyze preliminary data from the systems at the identified sites.

The Recipient shall:
- Utilize existing data collection tools to gather data from the selected sites for a minimum of six months, whenever feasible.
- Analyze the data to evaluate requirements for the proposed building EMIS and control orchestrator.
- Report results of the analysis in *Preliminary System Analysis Technical Report.*

Products:
- Preliminary System Analysis Technical Report

Subtask 2.3: Develop Specifications for the Control Orchestrator That Manages the Microgrid and Building Components
The goal of this subtask is to design and develop the specifications of the control orchestrator software based on the target systems identified in the Target Systems for Optimization Technical Report and the specifications for integrating the control orchestrator with the building loads and the microgrid controller through the cloud platform.

The Recipient shall:
- Develop specifications based on use cases and systems to be controlled and describe how to connect the necessary hardware and the software components.
- Prepare a *Control Orchestrator Specification Technical Report* containing the software specifications, the requirements and the different components of the control orchestrator software. It should also describe how the different hardware and software components will be integrated.

Products:
- Control Orchestrator Specification Technical Report

TASK 3: SOFTWARE DEVELOPMENT & TESTING IN SIMULATION
Based on the specifications defined in Task 2, the goals of this task are to develop the software for the orchestrator, develop a simulation environment, and then test the orchestrator in the simulation environment.

Subtask 3.1 Develop Control Orchestrator
The goal of this subtask is to develop the control orchestrator based on the specifications and use cases defined in Task 2.

The Recipient shall:
- Leverage existing control software to develop the control orchestrator software that can manage DERs and loads in the microgrid to respond to the use cases.
- Update and finalize the open-source *Control Orchestrator Software Repository* after field testing.

- Publish an open-source version of the Control Orchestrator Software Repository and a *Control Orchestrator Software Technical Memorandum* describing the features, use-cases, code, and functionality of the repository.

Products:
- Control Orchestrator Software Repository (draft and final)
- Control Orchestrator Software Technical Memorandum

Subtask 3.2 Develop Simulation and Emulation Models
The goals of this subtask are to develop the simulation models required to test the control orchestrator software in simulation, the load emulator (i.e., simulation running in real-time, interfaced with real equipment), and interfaces to emulate different building loads at a microgrid testbed.

The Recipient shall:
- Leverage modeling and simulation tools to define scenarios and requirements for the simulation.
- Develop simulation models.
- Develop the load emulation models.
- Publish the models to the *Updated Control Orchestrator Software Repository.*

Products:
- Updated Control Orchestrator Software Repository

Subtask 3.3 Test Control Orchestrator in Simulation Environment
The goal of this subtask is to develop the test plan and conduct the evaluation of the control orchestrator software in the simulation environment before conducting the lab and field tests.

The Recipient shall:
- Develop a *Control Orchestrator Simulation Test Plan* to evaluate the control orchestrator under different scenarios in the simulation environment.
- Evaluate the performance of the control orchestrator based on the *Control Orchestrator Simulation Test Plan* and document the results in the *Control Orchestrator Simulation Test Technical Report,* which is 5-10 pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
    - A summary of the testing parameters,
    - An overview of the evaluation methods, and
    - A conclusion of efforts before progressing to lab and field tests.
- Prepare *CPR Report #1* and participate in a CPR meeting, per subtask 1.3.

Products:
- Control Orchestrator Simulation Test Plan
- Control Orchestrator Simulation Test Technical Report
- CPR Report #1

TASK 4: TESTING OF NEW STRATEGIES AT THE MICROGRID TESTBED
The goal of this task is to test the new control orchestrator at a microgrid testbed integrated with the Rapid Integration and Commercialization Unit (RICU) cloud platform.

Subtask 4.1: Develop Control Orchestrator Hardware-in-the-loop Test Plan
The goal of this subtask is to develop the test plan for the hardware-in-the-loop evaluation of the control orchestrator at a microgrid testbed, with a cloud platform and emulated building loads.

The Recipient shall:

- Develop a test plan to evaluate the control orchestrator at the RICU testbed, with the cloud EMIS platform and emulated building loads.
- Identify metrics to be tracked during the evaluation.
- Document the test plan and relevant metrics in the *Control Orchestrator Hardware-in-the-loop Test Plan,* which is 3-5 pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience.

Products:

- Control Orchestrator Hardware-in-the-loop Test Plan

Subtask 4.2: Integrate the Software and the Hardware Systems at the Microgrid Testbed
The goals of this task are to 1) integrate the load emulators and the load bank hardware at the microgrid testbed, 2) deploy the cloud platform at the testbed, and 3) deploy the control orchestrator software on the cloud platform and configure the necessary inputs and outputs.

The Recipient shall:

- Connect the load emulators developed in Task 3 to the load bank at the microgrid testbed to emulate different building loads.
- Deploy the cloud platform and connect all the sensors and actuators from the on-site systems to the platform.
- Deploy the control orchestrator software to the cloud platform and configure the inputs and outputs of the software with the necessary points on the platform
- Conduct functional testing to ensure that all the necessary data is being communicated to the platform and necessary setpoints can be written to the load bank and the microgrid system.
- Document different software and hardware systems deployed, the integration process, and the results of the functional testing in the *Microgrid Testbed Commissioning Technical Report,* which is 5-10 pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
    - A description of the software and equipment to be tested,
    - A description of the methodology,
    - A list of goals and objectives for each test

Products:

- Microgrid Testbed Commissioning Technical Report

Subtask 4.3: Perform Testing of the Control Orchestrator at the Microgrid Tested with Emulated Building Loads
The goal of this subtask is to conduct the evaluation of the control orchestrator at the microgrid testbed before conducting the field tests.

The Recipient shall:

- Evaluate the performance of the control orchestrator based on the Control Orchestrator Hardware-in-the-loop Test Plan and document the results in the *Control Orchestrator Hardware-in-the-loop Test Technical Report,* which is 5-10 pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
    - A summary of the testing parameters,
    - An overview of the evaluation methods, and
    - A conclusion of efforts before progressing to lab and field tests.
- Prepare *CPR Report #2* and participate in a CPR meeting, per subtask 1.3.

Products:

- Control Orchestrator Hardware-in-the-loop Test Technical Report
- CPR Report #2

TASK 5: TESTING AT FIELD SITE
The goals of this task are to test and evaluate the performance of the control orchestrator at the pilot field site.

Subtask 5.1 Confirm Selection of Field Site
The goals of this subtask are to confirm the project pilot sites and execute any agreements necessary to secure these sites.

The Recipient shall:

- Reach an agreement with the manager of the selected pilot site regarding the project timeline, space reserved for the project, equipment, and additional sensor installation, permit and insurance requirements, indemnity, and the Recipient's use of any removal or support staff.
- Prepare and provide a *Site Readiness Verification Document(s)* (e.g., Copy of Contract, Lease Agreement, Memorandum of Understanding) for the site.

Products:

- Site Readiness Verification Document(s)

Subtask 5.2 Develop a Measurement and Verification (M&V) Plan
The goal of this subtask is to develop a detailed M&V Plan.

The Recipient shall:

- Develop a detailed *Measurement and Verification Plan,* to include:
    - Monitoring and instrumentation equipment to be used

- Key input parameters and output metrics to be measured
- Required data acquisition criteria, such as sampling frequency for various parameters
- Standard operating conditions used as a baseline for the M&V plan
- Analysis methods to be used to measure all performance criteria listed in the Agreement Objectives section of this Scope of Work
- Metrics for calculating and quantifying the performance of the proposed technology
- Additional information necessary to complete the M&V task (e.g., utility tariffs).

Products:

- M&V Plan

Subtask 5.3 Perform Pre-Optimization Energy Audit and Analysis of Buildings and Microgrid Data

The goals of this subtask are to: 1) audit the microgrid and the building loads prior to the optimization; 2) analyze and create normalized baselines and multi-variable models of the microgrid and building loads' energy use based on the performance in the pre-optimization period.

The Recipient shall:

- Produce a *Pre-Optimization Analysis Technical Report* that is 3-10 pages, will contain applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
  - Results of the detailed analysis of the energy use of the microgrid, the building, and its loads during the 6-12-month pre-optimization period.
  - Normalized energy usage models for each system (for both the microgrid and the building) to be used for performance assessment.

Products:

- Pre-Optimization Analysis Technical Report

Subtask 5.4 Deploy Cloud Platform, Connect Energy Systems, and Modify as Needed

The goals of this subtask are to deploy the cloud platform at the field site, connect the microgrid system and building loads to the platform, and install additional equipment as necessary to ensure connectivity with the EMIS. This results in establishing real-time telemetry from both the microgrid components and the building loads being communicated to the cloud platform.

The Recipient shall:

- Deploy the cloud platform and connect all the sensors and actuators from the microgrid system and the building loads to the platform.
- Conduct functional testing to ensure that all the necessary data is being communicated to the platform and necessary setpoints can be written to the building loads and the microgrid system, and document the results in the *Field Test Commissioning Technical Report* that is a minimum of 10 pages, will contain applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
  - A final schedule of completed milestones
  - A description of lessons learned, including the results of the interconnection, metering arrangement, and system commissioning process

    - A summary of major project changes and any unique challenges or lessons faced in bringing the development system online.
    - A description of the results with commissioning testing
- Write custom "Automated Fault Detection and Diagnostic" rules and generate custom Commissioning Reports (CxR) in the EMIS for the selected test site to compare current operations to the design intent.
- Utilize CxRs for each equipment type to highlight issues, design intent deviations, and optimization opportunities.
- Conduct functional performance testing on failed HVAC and other equipment, as applicable.

Products:
- Field Test Commissioning Technical Report

Subtask 5.5 Deploy the Control Orchestrator on the Cloud Platform
The goal of this subtask is to deploy the control orchestrator on the cloud platform, provide the necessary inputs to it, and communicate the necessary outputs from it to the microgrid and building loads.

The Recipient shall:
- Deploy the control orchestrator software on the cloud platform and configure the inputs and outputs of the software with the necessary points on the platform.
- Conduct functional testing to ensure that the control orchestrator is receiving the necessary data and can send the generated control actions from and to the microgrid and the building loads via the cloud platform, and document the results in the *Field Test Control Orchestrator Commissioning Technical Report* that is a minimum of 10 pages, will contain applicable graphics and figures, and will have an executive summary that is written for a non-technical audience. The report will include, but is not limited to:
    - A final schedule of completed milestones
    - A description of lessons learned, including the results of the interconnection, metering arrangement, and system commissioning process
    - A summary of major project changes and any unique challenges or lessons faced in bringing the development system online.
    - A description of the results with commissioning testing

Products:
- Field Test Control Orchestrator Commissioning Technical Report

Subtask 5.6 Evaluate Performance Based on Measurement and Verification Plan
The goal of this subtask is to conduct a long-term evaluation of buildings according to the M&V plan.

The Recipient shall:
- Execute the M&V Plan by testing the operation and performance of the microgrid and the building loads at the field site after deploying the optimization software and the control orchestrator software.
- Document the results of the tests in a *Building Performance Evaluation Report*. This report will be a minimum of 10 pages and will include, but is not limited to:

- The operational performance, including operational constraints, interactions with the grid, and response to grid emergencies.
- Measurements showing achievement of the project goals and objectives.

Products:
- Building Performance Evaluation Report (draft and final)

Subtask 5.7 Evaluate Impact of Load Growth Scenarios
The goal of this subtask is to evaluate the impact of the new optimization and orchestrator tools on the economics of the microgrid, considering different load growth scenarios.

The Recipient shall:
- Conduct growth scenario evaluation for the building loads based on customer projections and data-driven analytics through the EMIS platform. The activities include, but are not limited to:
  - Profiling load for better prediction of future microgrid expansion
  - Real-time monitoring and control provide actionable data for the microgrid owner/operator for better-informed decisions
  - Forecasting and planning for seasonal or peak variations
- Define updated microgrid requirements for the tool based on the determined growth scenario.
- Utilizing existing open-source tools, developing an approach to evaluate the trade-offs between new hardware upgrades (e.g., additional Photovoltaics installations) and control upgrades for an existing or planned microgrid.
- Summarize the findings in a *Load Growth Scenarios Technical Report that will be a minimum of 5* pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience.

Products:
- Load Growth Scenarios Technical Report

TASK 6: SCALABILITY ANALYSIS AND VALUE PROPOSITION OF THE TECHNOLOGY
The goal of this task is to demonstrate the scalability of the proposed approach by testing the orchestrator on a second microgrid using simulations and to develop a package to scale this approach to additional sites.

Subtask 6.1: Demonstrate the Validity of the Control Orchestrator Software on an Additional Microgrid Using Simulation
The goal of this subtask is to model a new microgrid in simulations and evaluate the scalability of the proposed approach by tracking the effort required for the setup, including comparing to the existing control implementation process and gauging the performance of the control orchestrator on this second microgrid using simulations.

The Recipient shall:
- Based on the results of Subtask 6.1, develop a microgrid model using the components developed in Task 3 and the testbed data collected in Task 4.
- Implement the control orchestrator to manage the new microgrid and the corresponding building loads.

- Test performance of the orchestrator in simulation.
- Track implementation costs and labor time.
- Evaluate the scalability of the proposed approach and the challenges that remain to be addressed.
- Evaluate benefits, changes, and overall impact on Indian Energy microgrid development processes.
- Report the experimental setup and the results of this evaluation in the *Control Orchestrator Scalability Analysis Technical Report* that is 3-5 pages, will include applicable graphics and figures, and will have an executive summary that is written for a non-technical audience.

Products:
- Control Orchestrator Scalability Analysis Technical Report

Subtask 6.2: Develop a Technology Package and Evaluate Value Proposition
The goal of this subtask is to develop a technology package that can be used by the Recipient for new and existing microgrids and evaluate its value proposition when deployed in multiple microgrids across California.

The Recipient shall:
- Document tools, software, and processes used during the project.
- Identify new intellectual property developed during the project.
- Based on the results of simulation testing, the testbed evaluation, the field testing, and the growth analysis, define how to create a tech package to offer to the Recipient's clients.
- Evaluate changes required to existing workflows and resource implications.
- Determine the value proposition of the proposed technology when deployed at scale across California, including economic benefits, improvements in resiliency and reliability of power supply, and operational efficiency.
- Document findings in a *Technology Package and Value Proposition Technical Report* that is 5-10 pages, includes applicable graphics and figures, and will have an executive summary that is written for a non-technical audience.

Products:
- Technology Package and Value Proposition Technical Report

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
- Documentation of Organization Profile on EnergizeInnovation.fund

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

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

The Recipient Shall:

- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the draft *Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Technology Transfer Plan. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the final *Technology Transfer Plan*.

    - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the final *Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in final *Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in the annual Electric Program Investment Charge (EPIC) symposium(s) sponsored by the 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:

- Technology Transfer Plan (draft and final)
- Summary of TAC Comments
- Technology Transfer Summary Report (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the Project Schedule Excel spreadsheet.