



California
ENERGY COMMISSION



**California Energy Commission
August 17, 2026 Business Meeting
Backup Materials for The Regents of the University of California, on behalf of its
Irvine 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

CALIFORNIA ENERGY COMMISSION

PROPOSED RESOLUTION: The Regents of the University of California, on behalf of its Irvine Campus

RESOLUTION NO: 26-0817-XX

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-26-003 with The Regents of the University of California, on behalf of its Irvine Campus for a \$932,718 grant. This follow-on project builds on prior EPIC-funded research under EPC-15-086, which demonstrated how advanced control of the electric distribution system can increase the amount of clean energy the grid can support. This project will evaluate how home microgrids and vehicle-to-home technology at an existing residential community in Menifee can reduce grid stress, improve resiliency, lower customer electricity costs, and help defer grid upgrades; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

APPROVED AND ADOPTED this 17 day of August 2026, by the following vote:

AYE:

NAY:

ABSENT:

ABSTAIN:

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 approved and adopted by affirmative vote of the CEC at a meeting held on August 17, 2026.

Kim Todd
Secretariat



GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-26-003

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Katelynn Dinius
3. Phone Number: 279-250-8836

C. Recipient's Information

1. Recipient's Legal Name: The Regents of the University of California, on behalf of the Irvine Campus

D. Title of Project

Title of project: Residential Microgrids in Support of Smart Grid Innovation

E. Term and Amount

1. Start Date: 9/1/2026
2. End Date: 3/31/2029
3. Amount: \$932,718.00

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 8/17/2026
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Katelynn Dinius
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Electric Program Investment Charge (EPIC)

Project Description:

The Regents of the University of California, on behalf of the Irvine Campus. Proposed resolution approving agreement EPC-26-003 with The Regents of the University of California, on behalf of the Irvine Campus for a \$932,718 grant and adopting staff's recommendation that this action is exempt from CEQA. This follow-on project builds on prior EPIC-funded research under EPC-15-086, which demonstrated how advanced control of the electric distribution system can increase the amount of clean energy the grid can support. This project will evaluate how home microgrids and vehicle-to-home (V2H) technology at an existing residential community in Menifee, California, can reduce grid stress, improve resiliency, lower customer electricity costs, and help defer grid upgrades. (EPIC funding)
Contact: Katelynn Dinius

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

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, sec. 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 California Environmental Quality Act (CEQA). The proposed project consists of research, testing, and data collection from equipment already installed at existing residential homes in Menifee, CA, with no construction or significant site alteration. It will not result in a serious or major disturbance to an environmental resource. This project will result in negligible or no expansion of use beyond that already existing. Therefore, the project falls within section 15301 and will not have a significant effect on the environment.

Cal. Code Reg., 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. This involves leveraging software tools and collecting data from existing and pre-installed equipment to conduct a study and analyze resulting data to model the effect of microgrids and Vehicle-to-Home technologies to the grid. There will not be a



disturbance to an environmental resource. Therefore, the project is exempt under Cal. Code Regs., tit 14, sec. 15306.

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”.

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
No subcontractors to report	\$ 0	\$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
No vendors to report	\$0	\$0

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	25-26	301.001M	\$ 932,718

TOTAL Amount: \$ 932,718

R&D Program Area: ESB: Transportation

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Jeff Wojciechowski

Address: University Of California, Irvine 131 Engineering Laboratory Facility

City, State, Zip: Irvine, CA 92697-0001

Phone: 949-824-1915

E-Mail: jsw@apep.uci.edu



2. Recipient's Project Manager

Name: Scott Samuelson

Address: Uc Irvine

City, State, Zip: Irvine, CA 92697-3550

Phone: 949-824 -7302

E-Mail: gss@apep.uci.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 #	Not applicable
First Come First Served Solicitation #	Not applicable
Other	Follow-on Funding

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



STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Grant Request Form
CEC-270 (Revised 01/2026)

Approved By

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

Agreement Manager: Ran Laviv

Approval Date: 6/23/2026

Office Manager: Rey Gonzalez

Approval Date: 6/24/2026

Deputy Director: Rey Gonzalez for Jonah Steinbuck

Approval Date: 6/24/2026

Exhibit A
Scope of Work
Regents of the University of California,
on behalf of the Irvine Campus

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		General Project Tasks
2		Home Microgrid
3	X	Vehicle-to-Home (V2H) Attributes
4		Residential Community Microgrids
5		Economic, Environmental, and Scalability Analyses
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
BESS	Battery Energy Storage System
BTM	Behind the Meter
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CES	Community Energy Storage
CPR	Critical Project Review
DER	Distributed Energy
EVSE	Electric Vehicle Supply Equipment
GHG	Greenhouse Gas
HB	Home Battery
HEMS	Home Energy Management System
HM	Home Microgrid
NEM	Net Energy Metering
PEV	Plug-in Electric Vehicle
PSPS	Public Safety Power Shutoff
RCM	Residential Community Microgrid
RTDS	Real Time Data Simulation
TAC	Technical Advisory Committee
V2H	Vehicle-to-Home
ZERH	Zero Energy Ready Home

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.

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

A. Purpose of Agreement

The purpose of this Agreement is to fund research to assess (1) the value of Home Microgrids and Residential Community Microgrids for reducing grid stress, increasing resiliency for customers, and increasing the efficacy of all-electric homes; (2) the operation of Home Microgrids and Residential Community Microgrids to forgo grid upgrades by leveraging flexible load and generation resources offered by residential microgrids and increasing feeder-level resilience; and (3) the role of Vehicle-to-Home (V2H) technology for further reducing grid stress, increasing resiliency for customers, and reducing customer electricity costs.

B. Problem/ Solution Statement

Problem

Meeting California's ambitious energy and climate mandates requires rapid, coordinated progress in residential electrification, distributed renewable generation, and zero-emission vehicle integration. Critical knowledge gaps are slowing this progress. Developers, utilities, and regulators lack utility-validated, real-world performance data on all-electric Zero Energy Ready Homes (ZERH). Grid operators lack demonstrated frameworks for deploying community microgrids and V2H systems at scale without costly distribution upgrades. Without this evidence, market hesitancy will continue to delay electrification at the pace required by state law.

The absence of statistically meaningful, utility validated performance data on all-electric ZERH remains one of the most significant barriers to broader adoption. Home developers and consumers alike lack the confidence to invest in all-electric construction under Title 24, without validation of promised energy cost savings, grid benefits, and improved occupant comfort through improved energy resiliency. Similarly, further work is needed to maximize benefits and reduce upfront costs, which could be achieved through more integrated system approaches. SB 1339 calls for expanded microgrid deployment to strengthen community resilience (particularly during Public Safety Power Shutoff (PSPS) events and extreme weather), yet utilities lack proven microgrid deployment blueprints for scaling. Although Residential Community Microgrids represent a proven concept, no large-scale demonstration has yet produced comprehensive design, control, and interconnection templates that utilities and communities need to replicate deployments efficiently and affordably.

California's roughly 80,000 new homes per year² represent an enormous and largely untapped opportunity for all-electric Home Microgrid-ready construction. Yet developer hesitancy persists

² California's Housing Future: Challenges and Opportunities Final Statewide Housing Assessment 2025
https://www.hcd.ca.gov/policy-research/plans-reports/docs/sha_final_combined.pdf

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because the business case for all-electric homes remains unsupported by independently validated cost and performance data at a commercially meaningful scale. AB 3232 requires a pathway to zero-emission buildings, but achieving that pathway depends on real-world data that confirms all-electric homes perform reliably and cost-effectively across diverse conditions. Furthermore, more than 24% of California households located within homeowners' associations³ represent a natural organizational structure for community-level microgrid deployment, yet uptake under SB 1339 and the Microgrid Incentive Program⁴ remains limited in the absence of replicable deployment templates and demonstrated financial and resilience benefits. Lastly, approximately 1.8 million electric vehicles are already registered in California,⁵ and policies like Executive Order N-79-20 will increasingly drive adoption going forward. Each of these vehicles represents up to 100 kWh of latent storage capacity sitting idle at a home for roughly 70% of the day.⁶ However, the absence of utility-approved V2H interconnection agreements, standardized tariffs, and empirically validated use-case performance data means this distributed storage resource remains commercially inaccessible to most California households.

Solution

This is a follow-on agreement to Substation Automation and Optimization of Distribution Circuit Operations (EPC-15-086), which demonstrated that substation-level control and automation materially increase PV hosting capacity of distribution circuits without hardware upgrades. This follow-on agreement will extend this finding to a feeder populated with Home Microgrids and Residential Community Microgrids, with the feeder itself controlled as a microgrid. Real-time digital simulation will validate control strategies for grid-connected, islanding, blackstart operations, and PSPS resilience, producing replicable design and interconnection templates for California's investor-owned utilities. Collectively, these contributions accelerate the achievement of California's statutory milestones for electrification and zero-emission vehicle adoption.

Additionally, in 2022, the U.S. Department of Energy (DOE) funded a five-year Connected Residential Community Microgrid demonstration project in Menifee, California. The project completed its development phase with a comprehensive research framework already in place. However, the DOE canceled the project in October 2025, creating an opportunity to gather data and finalize the research in order to provide concrete learnings and benefits to California and accelerate outcomes advancing California's energy goals.

This follow-on agreement will bridge the funding gap left by the DOE cancellation by deploying an integrated research and demonstration framework across three interconnected technology domains: Home Microgrids, Residential Community Microgrids, and Vehicle-to-Home systems.

³ U.S. Census Bureau <https://www.census.gov/library/stories/2025/09/condo-hoa-fees.html>

⁴ <https://www.cpuc.ca.gov/resiliencyandmicrogrids>

⁵ California Energy Commission. Light-Duty Vehicle Population in California.

<https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/light>

⁶ Vehicle dwell time based on average home dwell time reported in the 2022 National Household Travel Survey.

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The 219 occupied all-electric homes in Menifee represent one of the largest commercially deployed populations of ZERH, ENERGY STAR, WaterSense, and Indoor airPLUS homes in the state. Analysis of 15-minute metered data from this community, segmented by square footage, floor plan, and season, and benchmarked against an adjacent mixed-fuel community, can produce statistically meaningful, utility-validated performance evidence to potentially accelerate adoption of all-electric construction under future Title 24 updates to support building decarbonization.

Furthermore, this agreement will operationalize the storage capacity of plug-in electric vehicles at market scale through a first-of-its-kind SCE V2H Interconnect Agreement and demonstration using Kia vehicles and Wallbox bidirectional electric vehicle supply equipment (EVSE). Demonstrating V2H across eight controlled grid-tied and islanded use cases will produce empirical data to develop V2H tariffs, rulemaking and standard interconnection procedures and provide scalable resources on a timeline consistent with state energy goals.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Leverage and develop additional findings and insights provided by the Connected Residential Community Microgrids project, and extend and validate the results that emanated from EPC-15-086 by assessing the role of Home Microgrids and Residential Community Microgrids deployed within a substation feeder, which is controlled and managed as a microgrid. Thereby advance the performance, reliability, and resilience of the feeder.
- Capture lessons learned in the design, installation, and operation of Home Microgrids and Residential Community Microgrids.
- Capture lessons learned in the design, installation, and utilization of all-electric homes and thereby accelerate building electrification across the state.
- Capture lessons learned in the design, installation, and operation of V2H technology to enable V2H for mass market adoption.

Ratepayer Benefits:⁷ This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by advancing the deployment of coordinated Home Microgrids, V2H systems, and Community Microgrids across California's residential communities. The proposed project improves grid reliability and reduces infrastructure costs by increasing feeder PV hosting capacity through coordinated control across nested microgrids,

⁷ 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).

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deferring or avoiding costly distribution upgrades. Peak load reduction will further reduce strain on the grid. During outages, Home Microgrids can island and sustain critical loads for several hours and can extend to multi-day support with V2H and/or community level coordination. The agreement will also deliver substantial cost savings to ratepayers with the advancement of all-electric and V2H equipped homes, compared to dual fuel homes. Lastly, by eliminating on-site gas combustion and increasing renewable energy utilization, this agreement will reduce greenhouse gas (GHG) and air pollutant emissions, improving public health and safety outcomes for California communities.

Technological Advancement and Breakthroughs:⁸ 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 validating, for the first time at commercial scale, coordinated control strategies across a nested architecture of Home Microgrids, Residential Community Microgrids, and Vehicle-to-Home systems embedded within a feeder-level microgrid. The system will target all-electric homes equipped with PV, home battery storage, and V2H-enabled EVs, and will leverage a robust suite of communication protocols to enable fully automated bidirectional grid interaction. The result is a system capable of shedding and shifting loads and responding dynamically to grid signals. In contrast, the competing mixed-fuel PV only system offers limited demand response capability, no community-level automation, and no grid resilience capabilities.

The agreement will also generate transformative market and technical outcomes by directly addressing barriers to California's energy goals. The system will increase PV penetration for home loads, increase PV hosting capacity at the distribution level, and achieve energy savings at both the home and community levels. Critically, the system will support planned and unplanned islanding, enabling homes and communities to sustain power supply for multiple days, up to a week, off-grid, while the competing, mixed-fuel communities offer no grid resiliency. These breakthroughs will equip developers, utilities, and regulators with actionable evidence to establish V2H tariffs, standardized interconnection procedures, and replicable community microgrid templates, accelerating the commercial deployment of scalable, resilient, all-electric communities statewide.

⁸ 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.

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Agreement Objectives

The objectives of this Agreement are to:

- Acquire and analyze metered energy data from 219 all-electric Zero Energy Ready Homes, benchmarked against an adjacent mixed-fuel community, to validate a home energy model, identify optimal home energy management pathways, and conduct parametric Real-Time Data Simulations (RTDS) for grid-tied and islanded operation,
- Demonstrate and validate V2H capabilities across grid-tied and islanded use cases, leveraging six all-electric homes equipped with V2H systems, with results validated against parametric RTDS simulations,
- Develop and validate real-time simulation models of Residential Community Microgrids operating individually and as part of a 12 kV feeder controlled as a microgrid to quantify grid stress reduction, energy savings, and resiliency through planned and unplanned islanding use cases, and
- Conduct comprehensive cost-benefit, barrier, and emission impact analyses and translate findings into replicable deployment guidelines and a scalable framework for Home Microgrids and Residential Community Microgrids.

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.

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- 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.

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- 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.

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- 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 1.8) (*if applicable*)
- Permit Status Letter (subtask 1.9) (*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 should be made to the tasks, products, schedule, or budget. CPR meetings are a key opportunity for open and candid discussions between the CEC and the Recipient about project progress, challenges, and next steps. CPR meetings may also provide a forum for the Recipient to share project insights with interested CEC staff and CEC partners, at the CAM's discretion.

CPR meetings are typically scheduled at key inflection points in the project, as identified in the Task List on page 1 of this Exhibit. They should align with natural phase transitions, such as after design completion but before major procurement decisions, so that the CEC can make an informed Progress Determination based on project performance and risk. CPR meetings are generally conducted virtually but may be held at a project site, at the CEC, or another location, as determined by the CAM. Site visits are typical for demonstration projects or when in-person observation would enhance the CEC's understanding of project progress.

The CAM may schedule additional CPR meetings as needed to address emerging issues or concerns. The budget may be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase.

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The Recipient shall:

- Prepare and submit a *CPR Presentation* for each CPR meeting, structured to (1) report on progress with respect to the Scope of Work, budget, and schedule; identify any risks or needed changes to the Agreement; provide justification for continued funding; and (2) share project insights and progress towards achieving the Agreement's goals and objectives.

Attend the CPR meeting and deliver the *CPR Presentation* and any other requested material, as outlined in the *CPR Agenda* provided by the CAM.

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. The *CPR Agenda* will outline the structure and expectations for the *CPR Presentation*.
- Conduct each CPR meeting.
- Issue a *Progress Determination* summarizing the meeting, stating whether the project will continue, and identifying any potential modifications to the Agreement or its products. The *Progress Determination* may include conditions that the Recipient must meet for the project to continue to receive CEC funding.

Recipient Products:

- CPR Presentation(s)

CAM Products:

- CPR Agenda(s)
- Progress Determination(s)

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.

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- 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.

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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

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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 not 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.

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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.

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The Recipient shall:

- Execute and manage subawards 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 agreement 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.
- 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.

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- 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.

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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

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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

III. TECHNICAL TASKS

TASK 2 HOME MICROGRID

The goals of this task are to collect and analyze energy use data from a large population of newly-built commercially state-of-the-art Home Microgrid enabled all-electric homes in order to (1) inform best practices in the design and operation on all-electric homes; (2) develop optimal paths for home management systems; (3) conduct parametric analyses for both grid-tied and islanded operation to determine optimal control settings as a function of controlling factors (e.g., home design, energy use patterns, vehicle use patterns); and (4) evaluate the role and optimal use of V2H technology.

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Subtask 2.1 Acquire All-Electric Home Energy Data

The Recipient shall:

- For the 219 all-electric homes, acquire utility import and export data measured from the utility meter, local generation as measured from the solar systems, and home battery import and export and battery state-of-charge as measured by the battery control system.
- Engage with the community to explore the acquisition of additional, disaggregated load data from a subset of homes (ca. twenty to thirty).
- Provide a *Data Collection Summary* documenting the data collection completeness rate and trends across home types, including utility import/export, solar generation, and battery dispatch data.

Product:

- Data Collection Summary

Subtask 2.2 Compare All-Electric to Mixed-Fuel Home Energy Data

The Recipient shall:

- Using data from Subtask 2.1 and energy data collected from mixed-fuel homes in an adjacent community, assess the performance of the two categories of homes as a function of square footage, floor plan, and season.
- Develop a *Home Performance Benchmark Report* analyzing the energy performance of all-electric homes versus mixed-fuel homes, highlighting key performance differences and trends.

Product:

- Home Performance Benchmark Report

Subtask 2.3 Validate Home Energy Model

The Recipient shall:

- Using data from Subtasks 2.1 and 2.2, validate the home energy model, developed and verified for mixed-fuel homes under the DOE Connected Residential Microgrids project, for all-electric homes.
- Develop a *Home Model Validation Report*, summarizing validation results that confirm the accuracy of the home energy model for all-electric configurations, including validation methods and data input assumptions.

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Product:

- Home Model Validation Report

Subtask 2.4 Develop and Assess Optimal Paths for Home Energy Management

The Recipient shall:

- Establish cost-optimal and energy efficient-optimal home energy management pathways as a function of all-electric versus mixed-fuel, degree of home energy use, degree of plug-in electric vehicle (PEV) use, home square footage, and season of the year.
- Develop a *Home Management Optimization Report* delineating the energy management pathways explored,

Product:

- Home Management Optimization Report

Subtask 2.5 Inform Home Microgrid Management and Control

The Recipient shall:

- Use the results from Subtasks 2.1, 2.2, and 2.3, inform next-generation Home Energy Management Systems (HEMS) equipped with a universal DC hub and universal inverter in response to the proliferation of DC home energy DERs (e.g., PV, home batteries), and DC home loads (e.g., home batteries, PEV chargers, computer power, cell phone chargers).
- Develop a *Home Microgrid Controller Test Plan*, summarizing simulation test objectives, procedures, HEMS test configurations, parametric variables, and RTDS facility and equipment configurations for grid-tied and islanded Home Microgrid simulations.

Product:

- Home Microgrid Controller Test Plan

Subtask 2.6 Conduct Home Microgrid Simulations

The Recipient shall:

- For both grid-tied and islanding mode of operation, use an electrical model of the homes and real-time digital simulation (RTDS) to (1) simulate the Home Microgrid management system, and (2) conduct parametric analyses to evaluate optimal control settings as a function of all-electric versus mixed-fuel, degree of home energy use, degree of PEV use, home square footage, and season of the year.
- Develop a *Home Microgrid Simulation Results Summary*, presenting the RTDS simulation results.

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Product:

- Home Microgrid Simulation Results Summary

TASK 3 VEHICLE-TO-HOME (V2H) ATTRIBUTES

The goals of this task at the six homes equipped with a V2H-enabled Kia EV9 and a bidirectional Wallbox EVSE, are to demonstrate V2H attributes through grid-tied and islanded use cases with and without a HEMS.

Subtask 3.1 Collect V2H Data

The Recipient shall:

- With the six homes equipped with a V2H-enabled Kia EV9 and a bidirectional Wallbox EVSE, collect baseline home load, PV generation, home battery system charging and discharging data, and PEV charging and discharging data.
- Develop a *V2H Test Plan* delineating grid-connected and islanded use cases for demonstration and RTDS simulations.

Product:

- V2H Test Plan

Subtask 3.2 Perform Grid-Tied Use Cases

The Recipient shall:

- With the six homes equipped with a V2H-enabled Kia EV9 and a bidirectional Wallbox EVSE, demonstrate V2H attributes through grid-tied use cases:
 1. PV and Home BESS w/o V2H (Base Case)
Utilize the PV and Home BESS in three different BESS modes: (1) Self-supply, (2) Cost-saving, and (3) Reserve. Utilize the EVSE only as a unidirectional charger.
 2. PV and V2H w/o Home BESS
Utilize only the solar PV and V2H, and set minimum SOC of the PEV to accommodate homeowner vehicle-use schedule.
 3. PV, Home BESS, and V2H
Utilize all the home energy resources, prioritized in different orders and demonstrate two Home BESS modes (self-supply and cost-saving) with V2H.
 4. Optimized PV and Home BESS w/ V2H
Using data obtained, (1) use the home energy model to determine (for each homeowner use of loads and commute schedules) the optimum Home BESS mode that optimizes the use of V2H, and (2) repeat the preceding Use Case 3 to verify the model results.
- Develop a *V2H Grid-Tied Use Case Results Summary*, summarizing the demonstration of grid-tied V2H use cases.

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Product:

- V2H Grid-Tied Use Case Results Summary

Subtask 3.3 Perform Islanded Use Cases

The Recipient shall:

- With the six homes equipped with a V2H-enabled Kia EV9 and a bidirectional Wallbox EVSE, demonstrate V2H attributes through islanded use cases:
 1. PV and Home BESS w/o V2H (Base Case) With the Home BESS at 100% SOC, utilize the PV and Home BESS to establish the duration that the DER can support home loads in islanded mode.
 2. PV and V2H w/o Home BESS
Utilize only the solar PV and V2H to establish the duration that the DER can support home loads.
 3. PV, Home BESS, and V2H
With the Home BESS at 100% SOC, utilize the PV, the Home BESS, and V2H to establish the duration that the DER can support home loads.
 4. Optimized PV and Home BESS w/ V2H
Using data obtained, (1) use the home energy model to determine (for each homeowner use of loads and commute schedules) the optimum Home BESS mode to optimize the use of V2H, and (2) repeat the preceding Use Case 3 to verify the model results.
- Develop a *V2H Islanded Use Case Results Summary*, summarizing the demonstration of islanded V2H use cases.

Product:

- V2H Islanded Use Case Results Summary

Subtask 3.4 Construct Home Microgrid Simulations with V2H

The Recipient shall:

- Using an electrical model of the homes that includes V2H, use RTDS to (1) simulate the Home Microgrid management system, (2) conduct parametric analyses to evaluate optimal control settings as a function of all-electric versus mixed-fuel, degree of home energy use, degree of PEV use, dwell time of the PEV at home, home square footage, and season of the year, and (3) compare the simulation results to the Subtasks 3.2 and 3.3 Use Case #4 (Optimized PV and Home BESS w/ V2H) results.
- Develop a *V2H RTDS Simulation Results Report*, summarizing the simulation results for grid-tied and islanded Home Microgrid operation with V2H integration.
- Prepare a *CPR Report* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

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Product:

- V2H RTDS Simulation Results Report
- CPR Report #1

TASK 4 RESIDENTIAL COMMUNITY MICROGRIDS

The goals of this task are to simulate and evaluate the performance of Residential Community Microgrids, both individually and as part of a larger 12 kV feeder, in order to (1) quantify their impact on grid strain reduction, grid and customer resiliency, customer energy costs, and renewable energy utilization and (2) identify optimal energy management strategies for grid-tied and islanding operating conditions.

Subtask 4.1 Develop Simulation Models

The Recipient shall:

- Based on the SCE “Microgrid Design Study” for the two communities, construct: (1) an electrical model for a residential community microgrid that includes the resource controller (for controlling the two Residential Community Microgrids) and the microgrid edge controller (for managing control between the resource controller, the community energy battery, and the utility grid), and (2) an electrical model suitable for simulating an array of Residential Community Microgrids on a single 12 kV feeder.
- Develop a *Residential Community Microgrid Fact Sheet* outlining the final microgrid design for the simulation model.

Product:

- Residential Community Microgrid Fact Sheet

Subtask 4.2 Define Performance Metrics

The Recipient shall:

- Define the performance metrics and targets for the operation of: (1) Residential Community Microgrids, including load flexibility targets and energy efficiency improvements, and (2) an array of Residential Community Microgrids on a single 12 kV feeder.
- Develop a *Performance Metrics Summary* outlining the finalized performance metrics and the specific targets.

Product:

- Performance Metrics Summary

Subtask 4.3 Conduct Simulations with a Traditional Feeder

The Recipient shall:

- Develop a *Traditional Feeder Microgrid Simulation Test Plan* outlining simulation test objectives, procedures, operating conditions, grid outage scenarios, and RTDS facility

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and equipment configurations for grid-tied and islanded Residential Community Microgrid simulations on a traditional feeder, including critical load energization and blackstart scenarios.

- Conduct real-time simulations for both grid-tied and islanded use cases to quantify the role of Residential Community Microgrid resources (e.g., PV, home batteries, V2H, CES) on customer energy costs, reduction of grid strain, increase in grid and customer resiliency, and enhanced utilization of renewable energy, and (2) identify both grid and customer energy management pathways that optimize these attributes.
- In the event of a grid outage, conduct a real-time simulation wherein the feeder can be isolated from the grid and energized by one of more of the Residential Community Microgrids that reside on the feeder, through a cranking path, to energize one or more critical loads for public safety (e.g., a church campus serving as a shelter, grocery store) and disadvantaged communities.

Product:

- Traditional Feeder Microgrid Simulation Test Plan

Subtask 4.4 Conduct Simulations with a Feeder itself Controlled as a Microgrid

The Recipient shall:

- Develop a *Feeder-as-Microgrid Simulation Test Plan* outlining simulation test objectives, procedures, operating conditions, grid outage scenarios, and RTDS facility and equipment configurations for grid-tied and islanded simulations of a 12 kV feeder controlled as a microgrid with embedded Home Microgrids and Residential Community Microgrids.
- Conduct real-time simulations for both grid-tied and islanded use cases for a 12kV feeder, itself controlled as a microgrid, to quantify the role of Home Microgrid and Residential Community Microgrid resources (e.g., PV, home batteries, V2H, CES) on the reduction of grid strain, increase in grid and customer resiliency, and enhanced utilization of renewable energy
- Conduct real-time simulations for both grid-tied and islanded use cases for a 12kV feeder, itself controlled as a microgrid, to identify both grid management pathways that utilize and optimize these attributes.
- Develop a *Microgrid Simulation Results Report* summarizing the simulation results from Subtask 4.3 and 4.4, analyzing the findings for the tested use cases, and comparing microgrid performance under the two different paradigms.

Products:

- Feeder-as-Microgrid Simulation Test Plan
- Microgrid Simulation Results Report

TASK 5 ECONOMIC, ENVIRONMENTAL, AND SCALABILITY ANALYSIS

The goal of this task is to delineate the economic and environmental impacts of Home Microgrids and Residential Community Microgrids, the challenges and solutions to the

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challenges that inhibit the deployment in the market, and strategies and procedures which would scale market penetration through policy, regulation, and best practices.

Subtask 5.1 Conduct a Cost-Benefit Analysis

The Recipient shall:

- Using the data collected from the project, a cost-benefit analysis will be performed, including costs incurred in the project and economic benefits to the customer and aggregator or microgrid operator. The analysis will include at a minimum evaluating:
 - Costs and benefits between dual fuel and all-electric microgrid-capable communities,
 - The economic viability of grid services provided by Home Microgrids, Residential Community Microgrids, and V2H-enabled homes,
 - The distribution upgrade avoidance potential, considering the net impact of microgrid controls to optimize equipment sizing, increase local renewable integration, avoid distribution upgrades, and extend transformer life, and
 - The improvement in reliability provided by microgrid controls and coordinated distributed energy resources.
- Summarize analysis findings in a *Cost-Benefit Analysis Report*.

Product:

- Cost-Benefit Analysis Report

Subtask 5.2 Conduct a Barrier Analysis

The Recipient shall:

- Using lessons learned from designing and deploying Home Microgrids and the Residential Community Microgrids, identify the barriers encountered and make policy recommendations for minimizing or removing the barriers in order to facilitate the Home Microgrid and Residential Community Microgrid markets with emphasis on electrification and all-electric homes and considerations for disadvantaged and low-income communities.
- Develop a *Barrier Analysis Report* summarizing technology, policy, and market-based barriers to the deployment of microgrids at scale.

Product:

- Barrier Analysis Report

Subtask 5.3 Forecast GHG and Air Pollutant Impacts

The Recipient shall:

- Using the models developed as well as data collected from the demonstration, estimate the environmental impacts of the project in terms of GHG emissions.

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- Using the models developed as well as data collected from the demonstration, estimate the environmental impacts of the project in terms of air pollutant emissions.
- Provide estimates in a *GHG and Air Pollutant Impact Summary*.

Product:

- GHG and Air Pollutant Impact Summary

Subtask 5.4 Develop Guidelines for Replication

The Recipient shall:

- Using the data collected and lessons learned from the project, as well as the cost/benefit analysis, develop Replication *Guidelines for Replication* to facilitate deployment of Home Microgrids and Residential Community Microgrids in other climates and other locations with different grid issues and requirements, including considerations for disadvantaged and low-income communities that can enable adoption and target benefits in these communities. This analysis will help scale up these communities and provide a business model for the development of similar communities.

Product:

- Guidelines for Replication

TASK 6: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete the *Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be 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* if requested by the CAM. The survey covers, but is not limited to the following topics, as applicable to the project:
 - Changes in energy consumption, utility bills, and emissions
 - Public and private funding
 - Demonstration and deployment beyond the project Community engagement
 - Improvements in codes and standards
- Confirm and revise survey responses as directed by the CAM.
- 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 benefits questionnaire drafts.
- Complete the project profile on the CEC's public online project on the [Energize Innovation website \(www.energizeinnovation.fund\)](http://www.energizeinnovation.fund) and provide *Documentation of Initial Project Profile on EnergizeInnovation.fund*, including the profile link, to the CAM.
- Address any edits or questions from the CAM regarding the Energize Innovation Project Profile content.

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- If the 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](http://www.energizeinnovation.fund) (www.energizeinnovation.fund) and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link, to the CAM.
- If the Recipient's organizational profile is changed, update the organizational profile on the CEC's public online project and recipient directory on the [Energize Innovation website](http://www.energizeinnovation.fund) (www.energizeinnovation.fund), and provide a *Documentation of Updated Organization Profile on EnergizeInnovation.fund*, including the profile link, as needed.
- If the Recipient's project profile is changed, 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 Updated ([Year]) Project Profile on EnergizeInnovation.fund*, including the profile link, to the CAM.
- Address any edits or questions from the CAM regarding the Project Profile content.

Products:

- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Initial Project Profile on EnergizeInnovation.fund
- Documentation of Updated Organization Profile on EnergizeInnovation.fund (as needed)
- Documentation of Updated ([Year]) Project Profile on EnergizeInnovation.fund

TASK 7 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the scientific and techno-economic analysis and tools developed under this agreement are utilized in the energy policy, and/or planning decisions at the state and/or local levels, academic community and/or commercial sector.

The Recipient Shall:

- Develop and submit a *Knowledge Transfer Plan* that identifies the proposed activities the recipient will conduct to meet the goal of the task. The *Knowledge Transfer Plan* should include at a minimum:
 - Specific policy and planning efforts this project is expected to inform.
 - Specific stakeholder groups and energy policy and planning practitioners who will utilize the results of this project.
 - Proposed activities the Recipient will conduct to ensure the tools and results from this project will be utilized and adopted by the groups identified above.
- Present the *Draft Knowledge 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 Knowledge Transfer Plan*. This document will identify:
 - TAC comments the Recipient proposes to incorporate into the *Final Knowledge Transfer Plan*.

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- TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the *Final Knowledge Transfer Plan* to the CAM for approval.
- Implement the activities as described in the *Final Knowledge Transfer Plan*.
- Develop a *Knowledge 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 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:

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