California Energy Commission
November 08, 2023 Business Meeting
Backup Materials for Agenda Item No 08c:
ReMo Homes Inc.

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

RESOLUTION NO: 23-1108-08c

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: **ReMo Homes Inc.**

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

RESOLVED, that the CEC approves agreement EPC-23-020 with ReMo Homes Inc. for a $2,967,608 grant to develop, test, and demonstrate zero-carbon or near zero-carbon, cost-effective, modular, and manufactured homes that can be readily deployed. Research and development of the prefabricated homes will integrate advanced energy efficiency and renewable energy features addressing home affordability, and will also create resilient, zero-carbon energy efficient prefabricated homes; 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 November 08, 2023.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 9/2022)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-23-020

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Adel Suleiman
3. MS-:51
4. Phone Number: 916-996-1054

C. Recipient's Information

1. Recipient's Legal Name: ReMo Homes Inc.
2. Federal ID Number: 88-3732263

D. Title of Project

Title of project: ReMo Habitats

E. Term and Amount

1. Start Date: 11/30/2023
2. End Date: 3/31/2027
3. Amount: $2,967,608.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 11/08/23.
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Jason Tancher
5. Time Needed for Business Meeting: 10 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

a. ReMo Homes Inc. Proposed resolution approving agreement EPC-23-020 with ReMo Homes Inc. for a $2,967,608 grant to develop, test, and demonstrate zero-carbon or near zero-carbon, cost-effective, modular, and manufactured homes that can be readily deployed, and adopting staff's determination that this action is exempt from CEQA. Research and development of the prefabricated homes will integrate advanced energy efficiency and renewable energy features addressing home affordability, and will also create resilient, zero-carbon energy efficient prefabricated homes.

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, § 15302 ;

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.

The project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project site is not included on any list compiled pursuant to Government Code section 65962.5; and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.

IMPORTANT: consult with the legal office to determine next steps.

No

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

Additional Documents	Applies
Initial Study	No
Negative Declaration	No

Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. 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
ADL Ventures, LLC	$ 189,800	$10,000
Verdical Group	$ 45,000	$0
Budlong & Associates, Inc.	$ 50,000	$0
Domatic, INC.	$ 10,000	$0
Pacoima Beautiful	$ 90,000	$0
Chemehuevi Indian Tribe	$ 30,000	$0
U.S. Department of Energy (National Renewable Energy Laboratory)	$ 99,000	$50,000
Mass Timod, LLC.	$ 65,000	$30,000
ICC NTA, LLC.	$ 50,000	$0
CRATE Modular, INC.	$ 173,400	$0
United Building and Development Services LLC	$ 50,000	$0
Poon Design, Inc.	$ 25,000	$0
Susie Wong Public Affairs	$ 99,000	$0

I. 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	$	$

J. 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

K. 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	21-22	301.001I	$ 2,967,608

TOTAL Amount: $ 2,967,608

R&D Program Area: N/A:

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

L. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Vamsi Kumar Kotla

Address: 1519 W. 139th St

City, State, Zip: Gardena, CA 90249

Phone: 323-708-4094

E-Mail: vkk@remo.homes

3. Recipient's Project Manager

Name: Vamsi Kumar Kotla

Address: 1519 W. 139th St

City, State, Zip: Gardena, CA 90249

Phone: 323-708-4094

E-Mail: vkk@remo.homes

M. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-22-305
First Come First Served Solicitation #	Not applicable
Other	Not applicable

N. 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	Yes

Approved By

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

Agreement Manager: Adel Suleiman

Approval Date: 10/6/2023

Branch Manager: Anthony Ng

Approval Date: 10/6/2023

Director: Anthony Ng for Angela Gould

Approval Date: 10/6/2023

EXHIBIT A
Scope of Work
ReMo Homes Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Engage Community, Conduct first order assessment of innovative component technologies
3		Develop, Test, Prototype Innovative Component Technologies
4	X	Engineer and Manufacture V1 Habitat
5		Engineer, Manufacture and Field-Deploy V2 Habitat
6	X	Iterations, Optimization and Value Engineering
7		Manufacture and Deploy V3 Habitat
8		Scaling Strategic Plan and Final Reporting
9		Evaluation of Project Benefits
10		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
BIPOC	Black, Indigenous, People of Color
BIPV	Building Integrated Photovoltaic
BeOpt 3.0	Building Energy Optimization Tool 3.0
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
DAC(s)	Disadvantaged Communities
DfMA	Designed for Manufacturing and Assembly
EE	Energy Efficiency
FISS	Factory-Installed-Solar-and-Storage
LIC(s)	Low-income Communities
LVDC	Low voltage, direct current
MEP	Mechanical Electrical Plumbing
PV	Photovoltaic
TAC	Technical Advisory Committee
V1, V2, V3	Version 1, Version 2, Version 3
VIPP	Vacuum Insulated Prefabricated Panel

[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
ReMo Homes Inc.

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

A. Purpose of Agreement

The purpose of this agreement is to develop, test and demonstrate zero-carbon or near zero-carbon, cost-effective, modular and manufactured homes that can be readily deployed, particularly in under-resourced communities including California Native American Tribes. The Recipients intent is to increase cost-effectiveness of energy efficient pre-fabricated homes in under-resourced communities, including in fire prone areas. Research and development by the Recipients of prefabricated homes that integrate advanced energy efficiency and renewable energy features addresses home affordability and creates and demonstrates resilient, zero-carbon energy efficient prefabricated homes.

B. Problem/Solution Statement

Problem

California needs process and product innovation to achieve the states' ambitious 2030 housing target and future statutory energy goals. Specifically, zero-carbon buildings providing lower 10-year ownership costs are missing. This project will contribute to the state's housing goal of building 2.5 million homes by 2030 with by focusing on net zero homes from low-income and moderate-income households. In other industries, the cost for advanced clean energy technology is decreasing and advanced manufacturing techniques are thriving. In the modular construction industry, the significant information gaps have prevented the widespread adoption of zero-carbon building design strategies and affordable housing developments.

Even though up to a 50%-time savings is reported due to concurrent site and factory work, (Razkenari, et al 2020), currently, most of California's factory-built housing (modular) companies complete traditional construction under an existing roof. Too much energy efficiency (heat pump HVAC/water heater), emissions reductions (Solar and Storage installation) activities are still conducted on-site, seriously hurting the homeowner's potential for lower cost and construction time. There have been few, if any, installations of grid-interactive efficient buildings (GEB) from the industry, which is critical for peak shaving and decreased grid dependence on fossil fuels.

In addition, community engagement including California Native Tribes community involvement is minimal or missing. Few people outside of the industry know what modular construction or factory-built housing is. Resulting high housing and energy costs create a high rent-burdened and utility-burdened population, especially in the disadvantaged and low-income communities. As we create a scalable solution, the challenge is also to extend and share this knowledge to BIPOC industry practitioners spanning design, manufacturing, and occupancy of buildings.

Solution

The overarching goal for this project is to create decarbonization benefits in under-resourced, low-income (LICs), and disadvantaged communities (DACs) while providing affordable housing and reliable energy, benefiting both the public and the IOUs. The project's objective is to develop, demonstrate and measure the benefits of decarbonization through factory-built housing using multiple pilot sites spanning various climate zones, all in under-resourced, DACs, and LICs, often referred to as Environmental Justice Community of Concern (EJCOC) communities. The aim is to instill community pride for having cutting-edge environmental solutions. The

project will begin with community input to design and iterate to create durable homes meeting the community's housing and energy needs, while collaborating with existing prefabricated manufacturers and BIPOC practitioners in the AEC & Manufacturing industry, on understanding the barriers to industry decarbonization industry at scale.

The project seeks to decrease on-site work and maximize factory efficiency, integrate energy efficiency into the modules (containerizing), decrease the footprint of MEP (modularizing), and do Factory-Installed-Solar-and-Storage (FISS) to decrease both first and operational costs of zero-carbon all-electric homes. Additionally, the project aims to remove bottlenecks associated with construction by borrowing techniques and materials from the aerospace industry, with an emphasis on creating commercializable high-performance panels (thermal and fire) to exceed Title 24 requirements, and perfect dry construction techniques to eliminate liquids and adhesives, and which are ultimately safe to be deployed in fire-risk areas. Additionally, the project intends to use technologies such as BIPV to reduce grid burden by peak shaving.

These innovations ultimately decrease both the operational and the embodied carbon emissions from housing. To achieve scalability and replicability, the Recipient will document the processes thoroughly, maximizing the transfer of technology and replicability of outcomes, both within the organization and into the wider community.

C. Goals and Objectives of the Agreement

Agreement Goals
The goal of this Agreement is to create scalable zero-carbon affordable modular homes for commercially feasible rapid deployment, addressing the state's dual crises: housing affordability and sustainability. We will target the following performance metrics:

- 70% reduction in manufacturing and assembly time with total Habitat delivery time in about 1 month (manufacturing and onsite assembly).
- 10%-15% lower 10-year total ownership cost compared to current California T-24 affordable single-family housing.
- $250/s.f. total build cost for ReMo Habitat (at scale)—approximately 50% more affordable than current best-in-class affordable housing in California.
- Net-zero ReMo Habitat which is both islandable (100% for two days with battery, 100% load with sun, 75% peak load curtailment) and grid interactive, reducing grid strain and decarbonizing California's Utilities.
- VIPP + PV technology advancement target TRL 7 and field deployment in two ReMo Habitat's.

Ratepayer Benefits:[2]
This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by deploying net-zero, all electric, fire-resistant modular homes.

[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).

The ReMo Habitat will have envelope integrated photovoltaics covering the walls and roof (~20kW) as well as a 13.5kW battery storage. The energy system controls will be grid interactive and virtual power plant enabled providing energy and operational security. The ReMo Habitat will also be a safer home as is manufactured from non-combustible recycled steel and light gauge VIPP in-fill paneling.

Technological Advancement and Breakthroughs:[3]
This Agreement will lead to technological advancement and breakthroughs by supporting development of first-of-its-kind thermal storage technology. The project will help to overcome barriers to achieve California's statutory energy goals by targeting a hard-to-reach segment of electricity usage, 4-9 pm, when energy demand is high and renewable contributions diminish. As a result, GHG emissions savings of 10,530 MT CO2e are predicted annually at 10% adoption, helping California meets its various statutory climate goals. This CEC-funded development and demonstration can ensure this technology will reach maturity and be introduced significantly to the market.

Agreement Objectives
The objectives of this Agreement are to:

- Objective 1: Project organization, set up and management system
- Objective 2: Creating ReMo Habitat functional and performance specification
    - Performance Metric: Recipients net-zero carbon specifications
- Objective 3: Develop, Test, and Prototype Component Technologies. Development of high-performance market-available technologies by integrating into the following V1 Habitat conditions
    - Performance Metric: VIPP + PV R-50/inch, integrated PV as exterior facade and roof finish covering up to 60% of Habitat envelope
    - Performance Metric: VIPP + PV production cost target $9-18/sq.ft./inch
- Objective 4: Engineering, Manufacturing & Deployment of three ReMo Habitat prototypes
    - Performance Metric: Net-zero total build cost target $250/sq.ft. by 2027
    - Performance Metric: Target 0.2 factory man-hours per square foot
    - Performance Metric: Target 0-1000 kWh annual energy use
- Objective 5: Scaling Strategic Plan
    - Performance metric: Business plan to scale-up production and delivery of ReMo Habitats
- Objective 6: Evaluation of Project Benefits and Technology/Knowledge Transfer
    - Performance metric: Post occupancy data collection and validation

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

EXHIBIT A
Scope of Work
ReMo Homes Inc.

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 California Energy Commission's (CEC) software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick.

  The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
  - Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.

- Text documents will be in MS Word file format, version 2007 or later.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open-source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

  Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the CEC's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other CEC staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Administrative products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Match fund documentation (subtask 1.7);
  - Permit documentation (subtask 1.8);
  - Subcontracts (subtask 1.9); and
  - Any other relevant topics.

The technical portion of the meeting will include discussion of the following:
- The CAM's expectations for accomplishing tasks described in the Scope of Work;
- An updated Project Schedule;
- Technical products (subtask 1.1);
- Progress reports (subtask 1.5);
- Final Report (subtask 1.6);
- Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
- Any other relevant topics.

- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy

- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:
- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

Recipient Products:
- Kick-off Meeting Presentation
- Updated Project Schedule *(if applicable)*
- Match Funds Status Letter (subtask 1.7) *(if applicable)*
- Permit Status Letter (subtask 1.8) *(if applicable)*

CAM Product:
- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings
The goal of this subtask is to determine if the project should continue to receive CEC funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the CEC and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient and may include the CAO and any other individuals selected by the CAM to provide support to the CEC.

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

The Recipient shall:

- Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

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

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda(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 and the CAO of the following Agreement closeout items:
    - Disposition of any procured equipment.

  - The CEC's request for specific "generated" data (not already provided in Agreement products).
  - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
  - "Surviving" Agreement provisions such as repayment provisions and confidential products.
  - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.
- Provide Community Outreach and Engagement Reports (draft and final).
- Provide v1 Habitat Specification (final)
- Provide Component Technology & ReMo Habitat Feasibility Report including economic/impact modeling (final)
- Techno-economic Analysis and Benchmarking (final)

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

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

Products:
- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement.

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments 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 SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

The Recipient shall:
- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

  If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.

    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

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

Subtask 1.8 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:
- Permit Status Letter
- Updated List of Permits *(if applicable)*

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

Subtask 1.9 Subcontracts
The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:
- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of each executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)
The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:
- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.

- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

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

The Recipient shall:

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

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.

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

The TAC shall:

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

Products:

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

Subtask 1.12 Project Performance Metrics

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

The Recipient shall:

- Complete and submit the project performance metrics 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: ENGAGE COMMUNITY, CONDUCT FIRST ORDER ASSESSMENTS OF INNOVATIVE COMPONENT TECHNOLOGIES

The goal of this task is to evaluate first-order feasibility of key component technologies (economics, energy/sustainability performance, fire/seismic capabilities) which the team will be integrating into volumetric ReMo Habitats. Simultaneously, we will engage relevant stakeholders to design and specify the ReMo Habitats.

The Recipient shall:
- Coordinate with Community Based Organizations for each site in order for the Recipient to outreach and educate communities and surrounding communities to seek greater responsiveness to community and stakeholder needs, and a greater level of transparency and accountability on the part of the project. In addition, the Recipient will maintain and ongoing and constructive relationship with California state regulatory agencies and engage with stakeholders (disenfranchised and low-income communities, regulatory officials) to solicit design and functional requirements for affordable housing.
  - Engage locally and regionally, as well as educate and inform communities on the progress made on the ground with climate funding by the California Energy Commission, and other state agencies, intended to move California to a renewable energy economy through innovative technology adoption.
  - Inform target audiences—from community residents to businesses to multi-ethnic individuals and environmental groups—of the Recipient zero-carbon, cost effective, modular and manufactured home project.
  - Through dialogue and cooperation, integrate into the Recipient project consideration of community residents' different interests and points of view, about what is needed, what is missing, and what is possible.
  - The Community Groups and Tribes--together with the Recipient will coordinate with entities representing K-12 education and higher education to move workers into green sector jobs and inform on environmental justice.

- **San Fernando Activities**
  - Arrange quarterly meetings or events with impacted communities to engage in systematic and sustained interaction.
  - Integrate the Recipient projects into the existing Community Group 1 outreach activities and events, and development of new engagement opportunities,

Community Group 1 can deliver a coordinated and cohesive message to a broad cross section of community members.
  - Leverage Community Group 1 partnerships with other community groups and coordination community and regional outreach and engagement.
  - Coordinate with the Recipient to generate awareness of the Recipient zero-carbon modular and manufactured project.
  - Include outreach materials and timely announcements to Community Group 1 partners.
  - Educate the community on clean and renewable energy components of the project.
  - Ensure that public engagement plans incorporate community input to develop a specific communications plan and timeline, as well as a community assessment.

- **Tribe 1 Activities**
  - Arrange quarterly meetings or events with Tribe 1 community members to engage in systematic and sustained interaction.
    Integrate the Recipient projects into the existing Tribe 1 outreach activities and events, and development of new engagement opportunities to deliver a coordinated and cohesive message to community members.
    - Leverage Tribe 1 membership in the 25-member Southern California Tribal Regional Climate Collaborative (SCTCA) to community outreach and engagement.
      - The SCTCA will evaluate tribal climate needs, build partnerships, secure funding, provide support, and share resources to mitigate climate change efficiently and effectively for all member tribes.
    - Coordinate with the Recipient to generate awareness of the Recipient zero-carbon, cost-effective, modular and manufactured project.
    - Include outreach materials and timely announcement to community members.
    - Educate the community on clean and renewable energy components of the project.
    - Conduct first order “at industrialized scale” cost/benefit assessment of basket of technologies; VIPP, VIP windows, BIPV, MEP Pods, FISS, LVDC, Dry production.
    - Develop technology cost targets (at industrial scale) to establish design goals
- Establish verification and testing methods to demonstrate:
  - Quality
  - Performance
  - Replicability
- Create a *Verification Plan* for the development of both component technologies and ReMo Habitats that includes but is not limited to an outline of:
  - The tests being conducted
  - Critical metrics being validated
  - Measurement tools for verification
  - Desired certifications
- Submit draft *V1 Habitat Community Outreach and Engagement Reports (draft and final)* for feedback and incorporate changes in the next iteration of product development.
- Provide *V1 Habitat Specification (final)* for review

- Document findings in *Component Technology & ReMo Habitat Feasibility Report* which includes economic/impact modeling
- Prepare and submit *Component Technology & ReMo V1 Habitat Feasibility Report*
- Document findings in *Techno-economic Analysis and Benchmarking LCA Summary.*

Products:

- V1 Habitat Community Outreach and Engagement Report (draft & final)
- Verification Plan
- Component Technology & ReMo V1 Habitat Feasibility Report
- Techno-Economic Analysis and Benchmarking LCA Summary

TASK 3: DEVELOP, TEST AND PROTOTYPE INNOVATIVE COMPONENT TECHNOLOGIES

The goal of this task is to develop the key component technologies for use in the ReMo Habitats. During this task, a virtual Habitat prototype and numerical test methods will be developed to ensure iterative improvement on quality, performance, and replicability of the component technologies (VIPP + PV, MEP Pod, LVDC, etc.).

The Recipient shall:

Finalize *Small and Full Scale ReMo VIPP + PV Analysis and Test Plan* as outlined below:

- Enhance commercial insulated panels with vacuum and honeycomb evacuated cell panels.
    - Use commercial panels and inserts in prototypes
    - Compare insulative properties of VIP vs traditional envelopes.
    - Perform hygrothermal and fire resistance tests.
- Develop small-scale ReMo VIPP + PV prototypes and evaluate properties.
    - Create prototypes with alternative structural mediums and PV integration.
    - Record initial dimensions, weight, and physical properties.
    - Conduct R-value, hygrothermal, and fire resistance tests.
- Evaluate structural performance and refine finite element models
    - Test compressive strength, tensile strength, and bending.
    - Calibrate numerical models using test data.
- Develop integrated PV system and LVDC power system.
    - Optimize PV panel integration into ReMo VIPP panels.
    - Design UL-certified LVDC system for power transfer.
- Design and test full-scale ReMo VIPP envelope systems.
    - Design full-scale systems with PV integration
    - Fabricate prototypes for testing.
    - Perform fire testing following NFPA 285 standards
- Engineer and manufacture MEP pod for Habitat 1-3
    - Create virtual prototype of MEP Pod
    - Using NREL and VEIC designs, create the physical dimensions of the MEP Pod to house electrical panel, water heater, HVAC, battery storage
    - Integration of MEP Pod system controls, power systems and LVDC wiring
- Engineer and integrate power system:
    - Design LVDC system to replace conventional wiring for all lighting and ceiling fixtures.

  - Integration of Habitat Grid Interactivity using NREL's Forsee smart home system and building energy modeling toolset in BeOpt 3.0. (solar and battery)
  - Integration of Habitat VPP (all Habitat power systems)
- Engineer *Dry manufacturing Process Plan Summary* and onsite assembly processes
  - Connection design for easy VIPP + PV and module to module installation
  - Removal of drywall and replaced with magnetic interior wall finishes
    - Detailing and engineering for corners and transitions
  - Evaluate non-poured concrete foundation systems (helical piers, prefabricated systems, ground frame system, precast hybrid systems)
    - Run geotechnical analysis for the two Habitat jobsites to engineer alternative foundation system.
- Submit draft *Small Scale VIPP Prototypes Testing and Analysis Report to* the CAM for feedback and incorporate changes in the next iteration of product development.
- Submit draft *Full Scale VIPP Prototypes Testing and Analysis Report* to the CAM for feedback and incorporate changes in the next iteration of product development.
- Prepare draft *Component Technology & Integration Improvement Summary* which includes but not limited to:
  - Testing of the component technologies
  - Identify the platform for DfMA - integration of component technologies
  - Components reconfiguration modeling for ease of manufacturing and assembly
  - Design for disassembling
  - Technical issues
  - Lessons learned
- Submit draft *Component Technology & Integration Improvement Summary* to the CAM for feedback and incorporate changes in the next iteration of product development.

Products:
- Small Scale VIPP Prototypes Analysis and Testing Report
- Full Scale VIPP Prototypes Analysis and Testing Report
- Dry Manufacturing Process Plan Summary
- Component Technology & Integration Improvement Summary

TASK 4: ENGINEER AND MANUFACTURE V1 HABITAT
The goal of this task is to begin the iterative engineering process to integrate and optimize the component technologies into the v1 all-electric modular Habitat. This task begins the in-factory manufacturing and volumizing of prototype Habitat as an in-factory demonstration.

The Recipient shall:
- Create design (Revit model) and engineering of V1 Habitat using component technologies
  - Consider energy efficient glazing (vacuum insulated glass or "Triple thin") following their energy benefits and cost-effectiveness evaluation
- Design and engineering numerical evaluation and validation per ICC and California Title 24 Building Code Compliances
- Validate integration, assembly, and performance - V1 Habitat
  - Dry manufacturing performance review/update

  - Sub assembly system integration performance review (time saved, interconnections, performance)
- Verification and testing for:
  - V1 Habitat quality
  - V1 Habitat manufacturability, such as interoperability of software platforms and machinery equipment
  - V1 Habitat performance (energy efficiency, durability, safety)
- Conduct energy modeling of V1 Habitat
- Cradle to Cradle life cycle assessment of v1 Habitat (whole building) that includes raw material extraction, transportation, manufacturing, construction, operations, repair, demolition, and end-of-life disposal and recycling
- Prepare and submit draft *V1 Component Technology & Integration Summary* to the CAM for feedback and incorporate changes in the next iteration of product development.
- Prepare and submit *V1 Habitat Energy Modeling Report* to the CAM for feedback and incorporate changes in the next iteration of product development.
- Prepare and submit draft *V1 Habitat Design, Production & Assembly Summary* to the CAM for feedback and incorporate changes in the next iteration of product development.
- Participate in CPR per Subtask 1.3 and prepare *CPR Report #1*.

Products:
- V1 Component Technology & Integration Improvement Summary
- V1 Habitat Energy Modeling Report
- V1 Habitat Design, Production & Assembly Report
- CPR Report #1

TASK 5: ENGINEER, MANUFACTURE, FIELD DEPLOY V2 HABITAT
The goal of this task is to iteratively improve based on v1 learnings, continue development of ReMo VIPP, then manufacturer and field deploy v2 Habitat at climate zone 9 site.

The Recipient shall:
- VIPP + PV Continued Development
- Evaluation of Next-Generation Dynamic VIPP Systems to evaluate next-generation dynamic vacuum technology and interstitial radiant heat transfer control.
  - Develop small-scale prototypes of dynamic ReMo VIPP systems, incorporating active vacuum technology and interstitial radiant heat transfer control mechanisms.
  - Conduct thermal performance tests on the dynamic VIPP prototypes to evaluate their efficiency and effectiveness in comparison to the static ReMo VIPP panels.
  - Analyze the potential benefits and challenges of implementing dynamic ReMo VIPP systems in real-world applications.
- Data Analysis, Reporting, and Optimization of VIPP + PV performance and areas for improvement
  - Compile and analyze the data from all phases of testing.
- V2. VIPP + PV

    - Dynamic Vacuum Insulation: V2 integrates emerging technology for adjustable R-value based on internal and external temperatures, enhancing energy efficiency.
    - Radiant Heat Transfer Control: V2 incorporates advanced mechanisms for optimal interior temperatures and improved thermal performance.
    - PV System Integration: V2 efficiently integrates PV systems into VIPP panels for maximum solar energy utilization.
    - Optimized Design & Manufacturing: V2 applies design optimizations and manufacturing improvements for better performance, durability, and cost-effectiveness.
    - Real-world Applications: V2 addresses challenges and opportunities in implementing dynamic ReMo VIPP systems across various building types.
    - Performance Evaluation: V2 includes a thorough comparison of thermal performance with static ReMo VIPP panels and traditional insulation systems, demonstrating its advantages.
- Manufacture V2 of ReMo Habitat
    - Create manufacturing jigs, material handling, process flow (digital twin of process)
    - Develop module to module connection systems
- Secure site permits
- Prepare and submit *V2 Habitat Component Technology & Integration Improvement Report*
- Prepare and submit *V2 Habitat Transport and Field Assembly Report*
- Prepare and submit*V2 Habitat Energy Modeling Report*
- Installation of V2 Habitat at climate zone 9 site in the City of San Fernando
- Commissioning of V2 Habitat for data collection
- Verification and testing of:
    - Transport durability
    - On-site assembly ease, speed, and challenges
    - Finishing details and quality
- Submit *V2 Habitat Design, Production & Assembly Report* to the CAM for feedback and incorporate changes in the next iteration of product development.

Products:

- V2 Habitat Component Technology & Integration Improvement Report
- V2 Habitat Transport and Field Assembly Report
- V2 Habitat Energy Modeling Report
- V2 Habitat Design, Production & Assembly Report

TASK 6: ITERATION AND OPTIMIZATION AND VALUE ENGINEERING

The goal of this task is to incorporate all lessons learned to iterate on components and optimize integration for v3 Habitat build in Task 7. In the third iteration of the VIPP + PV system development, the focus would be on refining and enhancing the design based on the results and feedback from the first two iterations, with the inclusion of a dynamic vacuum insulation system that adjusts its vacuum level based on the desired interior temperature and external temperature, as well as incorporating LVDC (Low Voltage Direct Current) lighting and power utilization.

EXHIBIT A
Scope of Work
ReMo Homes Inc.

The Recipient shall:

- V3. VIPP + PV
    - Design Enhancements: Implement design optimizations from previous iterations, focusing on PV integration, structural performance, thermal efficiency, and aesthetics.
    - Advanced PV Technologies: Explore and incorporate innovative PV technologies to boost system efficiency and power generation capacity, such as bifacial or flexible solar panels.
    - MEP Pod Accessories & Thermal Battery: Integrate MEP pods with a thermal storage medium like sand to optimize heating and cooling system performance, leveraging sand's cost-effectiveness and thermal properties.
    - Dynamic VIPP System Improvement: Enhance performance and reliability by refining dynamic vacuum technology, radiant heat transfer control, and dynamic vacuum insulation adjusting R-value based on temperature.
    - LVDC Lighting & Power Integration: Design an efficient LVDC lighting and power distribution system within the VIPP+PV system to maximize energy efficiency and seamlessly integrate with PV-generated power.
    - Smart Building System Compatibility: Ensure seamless integration with smart building systems, including IoT devices, energy management software, and building automation systems.
    - Streamlined Manufacturing: Refine VIPP+PV system production processes for cost reduction, improved efficiency, and consistent quality.
    - Extended Testing: Validate improvements through additional testing, targeting specific areas of concern or improvement.
    - User Feedback & Market Research: Collect end-user feedback and conduct market research to inform design and development processes.
    - Environmental Impact Assessment: Evaluate the VIPP+PV system's environmental impact, considering material sourcing, energy efficiency, and end-of-life disposal or recycling.
    - Cost-Benefit Analysis: Assess the economic viability and competitiveness of the VIPP+PV system compared to traditional solutions.
    - Commercialization Preparation: Develop a plan for marketing, partnerships, and distribution channels to successfully introduce the enhanced VIPP+PV system to the market.
- DfMA review - Value engineering Habitat
    - Computer simulations (structure, economics, energy, CO2e) to reduce cost and improve performance
    - Dry production process review
- Material supply chain analysis
- Market channels / sales analysis
- Optimize integration and assembly engineering
- Finalize VIPP product
- Prepare and submit the *V3 Habitat Component Technology & Integration Improvement Report.*
- Participate in CPR per Subtask 1.3 and prepare *CPR Report #2*.

Products:
- V3 Habitat Component Technology & Integration Improvement Report
- CPR Report #2

TASK 7: MANUFACTURE AND DEPLOY V3 HABITAT
The goal of this task is to manufacture and deploy V3 Habitat for its second field installation at climate zone 15 site. This installation will occur on Native American land using the same GC / builder and set crew team in order to compare against V1 / V2.

The Recipient shall:
- Run *V3 Habitat Energy Modeling Report* scenarios and submit the V*3 Habitat Energy Modeling*
- Manufacture V3 Habitat
- Secure site permits
- Install V3 Habitat at climate zone 15 site in a tribal reservation located on the shores of Lake Havasu
- Commission V3 Habitat for data collection
- Verification and testing of:
    - Transport durability
    - On-site assembly ease, speed, and challenges
    - Finishing details and quality
- Prepare and submit *V3 Habitat Design, Production & Assembly Report* and *V3 Habitat Transport and Field Assembly Report* to the CAM for final feedback and recommendations.

Products:
- V3 Habitat Energy Modeling Report
- V3 Habitat Transport and Field Assembly Report
- V3 Habitat Design, Production & Assembly Report

TASK 8: SCALING STRATEGIC PLAN AND FINAL REPORTING
The goal of this task is to summarize the development process, compile the ReMo scale-up strategy which includes product designs, manufacturing requirements, assembly partners and long-term sales plan.

The Recipient shall:
- Update Cradle to Cradle life cycle assessment of v3 Habitat (whole building) that includes raw material extraction, transportation, manufacturing, construction, operations, repair, demolition, and end-of-life disposal and recycling
- Finalize *ReMo Full Revit Model (design / engineering), Shop Drawings, Field Installation Manual*
- Design ReMo Habitat factory and manufacturing system
- Create ReMo Habitat scale-up manufacturing and deployment strategy
- Revisit cost targets (at industrial scale) to refine design goals
- Submit *Factory Designs and Manufacturing System Summary*, *Scale-up Strategic Plan*, and *Final Project Report* to the CAM for feedback and recommendations

Products:

- Full Revit Model + Shop Drawings and Field Installation Manual
- Factory Designs and Manufacturing System Summary
- Scale-up Strategic Plan
- Final Project Report

TASK 9: 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 (draft)
- Annual Survey(s) (final)
- Final Project Benefits Questionnaire (final)
- Documentation of Project Profile on EnergizeInnovation.fund (final)
- Documentation of Organization Profile on EnergizeInnovation.fund (final)

TASK 10: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

EXHIBIT A
Scope of Work
ReMo Homes Inc.

The Recipient Shall:

- Develop and submit a *Project Case Study Plan*, outlining how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The Project Case Study Plan should include:
    - An outline of the case study's objectives, goals, and activities.
    - The organization conducting the case study and its plan for conducting it.
    - A list of professions and practitioners involved in the technology's deployment.
    - Specific activities the recipient will take to ensure the learning resulting from the project is disseminated to those professions and practitioners.
    - Presentations/webinars/training events to disseminate the case study results.
- Present the draft *Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* summarizing comments received from the TAC members on the draft *Project Case Study Plan*. This document will identify:
    - TAC comments the recipient proposes to incorporate into the final *Technology Transfer Plan*.
    - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the final *Project Case Study Plan* to the CAM for approval.
- Execute the final *Project Case Study Plan* and develop and submit a Project Case Study.
- When directed by the CAM, develop presentation materials for a CEC sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- Provide at least (6) six High Quality Digital Photographs (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- Technology transfer through the Recipients project participants (ADL Ventures to present project results to ABC Collaborative and National Science Foundation Industrial Offsite Construction Engine)

Products:

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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.