California Energy Commission
October 18, 2023 Business Meeting
Backup Materials for Agenda Item No 17b:
ZeroAvia Federal, 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: 23-1018-17b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: ZeroAvia Federal, 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 PIR-23-006 with ZeroAvia Federal, Inc. for a $3,250,000 grant to fund the development and demonstration of a mobile liquid hydrogen storage and dispensing system for refueling hydro-electric aircraft. The project will advance liquid hydrogen refueling for aviation with its demonstration at an airport in Kern County and the lessons learned will help decarbonize many applications in the transportation sector; and

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

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the CEC held on October 18, 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: PIR - 23 -006

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Antonio Gomez
3. MS-51
4. Phone Number: 916-776-7966

C. Recipient's Information

1. Recipient's Legal Name: ZeroAvia Federal, Inc.
2. Federal ID Number: 87-3965377

D. Title of Project

Title of project: Liquid Hydrogen Refueler for Hydrogen-Electric Aircraft Applications

E. Term and Amount

1. Start Date: 11/13/2023
2. End Date: 3/31/2026
3. Amount: $3,250,000.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 10/18/2023.
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Antonio Gomez
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: NaturalGas (NG Research Program).

Agenda Item Subject and Description:

ZeroAvia Federal, Inc. Proposed resolution approving agreement PIR-23-006 with ZeroAvia Federal, Inc. for a $3,250,000 grant to fund the development and demonstration of a mobile liquid hydrogen storage and dispensing system for refueling hydro-electric aircraft, and adopting staff's determination that this action is exempt from CEQA. The project will advance liquid hydrogen refueling for aviation with its demonstration at an airport in Kern County, but the lessons learned will be valuable for decarbonizing many applications in the transportation sector.

California Environmental Quality Act (CEQA) Compliance

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

   If yes, skip to question 2.

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

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

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

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

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

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

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

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

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

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

Cal. Code Regs., tit. 14, § 15301: A project that consists of the operation, maintenance, or minor alteration of existing public or private structures, facilities, mechanical equipment, involving negligible or no expansion of existing or former use is categorically exempt from CEQA. This project involves the system design, optimization, and integration of a mobile liquid hydrogen refueler that will all take place in existing research facilities. The mobile refueler will then be demonstrated for a short period of time at an existing airport already used for refueling aircraft and negligible expansion of existing use is expected. Therefore, this project is categorically exempt from CEQA.

This proposed project does 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

G. 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
Engineering, Procurement & Construction Firm (TBD)	$ 95,000	**$**0

H. 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	**$**	**$**

I. 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

J. 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
NG Subaccount, PIERDD	21-22	501.001	$ 3,250,000

TOTAL Amount: $ 3,250,000

R&D Program Area: EGRB: Transportation

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: 601 Program Continuous Appropriation

K. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Matthew Pates

Address: 90 Skylane Dr Hngr 1 HNGR 1

City, State, Zip: Hollister, CA 95023-2549

Phone: 720-771-2750

E-Mail: matthew.pates@zeroavia.com

3. Recipient's Project Manager

Name: TJ Singh

Address: 90 Skylane Dr Hngr 1 HNGR 1

City, State, Zip: Hollister, CA 95023-2549

Phone: 301-442-5052

E-Mail: tj.singh@zeroavia.com

L. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-22-502
First Come First Served Solicitation #	Not applicable

Other	Not applicable

M. 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: Antonio Gomez

Approval Date: 08/30/2023

Branch Manager: Reynaldo Gonzalez

Approval Date: 08/30/2023

Director: Reynaldo Gonzalez on behalf of Director

Approval Date: 08/30/2023

Exhibit A
Scope of Work
ZeroAvia Federal, Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Refueler System Development
3		Hydrogen Safety
4		Procurement and Build
5	X	Commissioning
6		System Deployment and Demonstration
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CDR	Critical Design Review
CPR	Critical Project Review
DOT	Department of Transportation
LH2	Liquid Hydrogen
MLHSD	Mobile Liquid Hydrogen Storage and Dispensing System
PDR	Preliminary Design Review
SRR	System Requirements Review
TAC	Technical Advisory Committee
TRR	Test Readiness Review
V&V	Verification and Validation

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development and demonstration of a Mobile Liquid Hydrogen Storage and Dispensing system (MLHSD) for refueling a hydrogen-electric aircraft. This high flow refueling system will be fully integrated onto a Class 6 truck chassis, meet airside certification standards, and will be powered by its own boil-off gas to improve system efficiency and reduce environmental impacts.

[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.

B. Problem/ Solution Statement

Problem

Today, there is no integrated, cost-efficient, and mobile way of storing and dispensing liquid hydrogen (LH2). This severely hinders adoption of LH2 in difficult-to-decarbonize transportation sectors such as aviation, maritime, and heavy duty. In the immediate term, achieving success in these areas will require an easily deployable, low cost solution that meets all safety and performance requirements. A mobile solution is necessary for widespread adoption because it allows for refueling in remote work locations, roadside assistance situations, aviation, maritime, and more.

Solution

The MLHSD addresses the above problems by creating a first-of-its-kind mobile LH2 refueling product that will meet Department of Transportation (DOT) and airside certification standards. To be a viable solution for fueling, the MLHSD will implement high fuel flow rates, a zero-boil-off system, and an automated control system. The technologies and solutions developed through this project could assist in the decarbonization of not only aviation, but also marine, rail, and heavy-duty trucks and busses.

C. Goals and Objectives of the Agreement

Agreement Goals
The goal of this Agreement is to:

- Design, build, and demonstrate a first-of-a-kind MLHSD system
- Demonstrate its safe and automated operation at the end of the project
- Minimize environmental impact by establishing an efficient, zero-boil-off solution

Ratepayer Benefits:

This agreement will result in increased safety to the ratepayer by improving air quality around the airports where the MLHSD is deployed. The refueler's unique zero-boil-off solution will minimize the climate impact associated with releasing boil-off hydrogen and the MLHSD will also promote the use of LH2 fueled equipment within the airports which would normally run on fossil fuels. These changes will reduce air and noise pollution in the surrounding area.

Technological Advancement and Breakthroughs:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by developing a zero-boiloff storage system (highly integrated insulation system in addition to cryocooler), a fast flow rate umbilical used for filling vehicles, and a safe, automated control system.

Exhibit A
Scope of Work
ZeroAvia Federal, Inc.

Agreement Objectives

The objectives of this Agreement are to:

-
- Design and build a Mobile Liquid Hydrogen Storage and Delivery system (MLHSD).
- Acquire DOT and Airside certification for the operation of the mobile refueling truck.
- Enable quick refueling of a Hydrogen Electric aircraft by dispensing fuel at 30-40kg/min.
- Implement a zero-boil-off system to power the MLHSD and reduce the climate impact of boil-off H2 released into the atmosphere (<0.05% H2 emissions).
- Demonstrate the MLHSD refueling capabilities and collect data to document the overall system performance and efficiency.

TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

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

For products that require a final version only

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

Exhibit A
Scope of Work
ZeroAvia Federal, Inc.

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.

Exhibit A
Scope of Work
ZeroAvia Federal, Inc.

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
- 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.

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

III. TECHNICAL TASKS

TASK 2 REFUELER SYSTEM DEVELOPMENT

The goal of this task is to define overall system requirements and perform the design of all MLHSD sub-systems. The sub-system components of the MLHSD are the following: LH2 Storage System, LH2 Filling & Dispensing System, Zero Boil Off System, Process & Controls, Automated Safety System. To simplify this Scope of Work document, all references to the collective individual sub-systems will henceforth be referred to as "sub-system components".

Subtask 2.1 Requirements Development

The goal of this subtask is to pass the Systems Requirements Review (SRR) by defining the baseline Level 0 and Level 1 requirements for the MLHSD and agreeing on a concept system and sub-system component architecture that could meet these requirements.

The Recipient shall:

- Formalize definition of Level 0 (Business and customer) requirements (Performance, safety, certifiability, operational, customer, maintainability, and serviceability, functional)
- Formalize definition of Level 1 (MLHSD) requirements
- Prepare baseline concept system architecture design that demonstrates potential of meeting the requirements
- Conduct a technology readiness review ensuring that proposed technologies allow to meet requirements
- Conduct SRR with internal stakeholders; document in *System Requirements Review Documentation* – this documentation will include requirements draft, concept architecture, available technologies, and MLHSD trade studies.
- Develop Physics-Based Models for System Design
- Update risk management plan (technology risks, timeline risks, e.g., ordering long lead time items at risk)

Products:

- System Requirements Review Documentation

Subtask 2.2 Preliminary Design

The goal of this subtask is to pass the Preliminary Design Review (PDR) by confirming/demonstrating that the level of technical risk attached to chosen concept is acceptable and the associated supply chain capable of meeting stated requirements.

The Recipient shall:

- Conduct necessary analytical sub-system-level validation of concept defined in SRR
- Collate prototypical and simulated evidence of subsystem development
- Demonstrate how the design solution meets Level 0 and Level 1 requirements confirmed during the SRR
- Analyze supply chain and manufacturing options, including preliminary bill of materials
- Create the design documentation baseline
- Provide the updated development plan
- Baseline all system interfaces
- Baseline the Validation and Verification (V & V) plan (test and validation strategy)

- Update risk management plan
- Conduct PDR with internal stakeholders; document in *Preliminary Design Review Documentation* – this documentation will include the following: interface definition, manufacturing/supply chain options, design documentation at all levels, bill of materials, and updated development plan.

Products:
- Preliminary Design Review Documentation

Subtask 2.3 Detailed Design
The goal of this subtask is to pass the Critical Design Review (CDR) by confirming/demonstrating that the detailed definition of the MLHSD and its supply chain, together with the structured V & V plans, will meet the stated requirements with an acceptable level of technical risk.

The Recipient shall:
- Conduct necessary analytical system-level validation of design defined in PDR to reduce highest-scoring technical risk in updated risk management plan
- Collate prototypical and simulated evidence of subsystem development
- Demonstrate how the detailed design solution meets Level 0 and Level 1 requirements frozen during the PDR
- Iterate design solution based on analytical/experimental evidence collated from subsystem and system analysis
- Develop a detailed manufacturing plan ready for manufacturing release, including a final bill of materials
- Issue final design documentation
- Freeze all interface requirements
- Update the V & V plan (test and validation strategy, including commissioning plan)
- Update the risk management plan
- Conduct CDR w/ internal stakeholders and with TAC members; document in *Critical Design Review Documentation* which will include analytical/experimental test data, final design documentation, detailed manufacturing definitions, and final bill of materials
- Prepare *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:
- Critical Design Review Documentation
- CPR Report #1

TASK 3: HYDROGEN SAFETY
The goal of this task is to develop a Hydrogen Safety Plan and perform Hydrogen Safety Design reviews at critical stages of the project.

Subtask 3.1 Hydrogen Safety Design Review
The goal of this subtask is to perform a Hydrogen Safety Design Review after the Critical Design Review

The Recipient shall:

- Brief Hydrogen Safety Panel on the third design iteration (Final Design); Detail findings in *Hydrogen Safety Design Review Documentation*

Products:

- Hydrogen Safety Design Review Documentation

Subtask 3.2 Hydrogen Safety Plan

The goal of this task is to develop a detailed hydrogen safety plan that the Recipient and any subcontractors or individuals involved in construction, operation, and maintenance of the MLHSD will follow throughout the project and as long as the MLHSD operates. The Recipient will collaborate with the Pacific Northwest National Laboratory (PNNL) Hydrogen Safety Panel (HSP) to ensure the plan is comprehensive and demonstrates a strong commitment to safety. The Recipient shall collaborate with the Pacific Northwest National Laboratory (PNNL) Hydrogen Safety Panel (HSP) to ensure the plan is comprehensive and demonstrates a strong commitment to safety.

The Recipient shall:

- Develop a Preliminary Hydrogen Safety Plan in accordance with the PNNL HSP's most recent version of public guidelines for safety planning for hydrogen and fuel cell projects available at: https://h2tools.org/bestpractices/safety-planning.
- Submit the preliminary plan to the PNNL HSP for assessment.
- Discuss the *PNNL HSP's Assessment of the Preliminary Hydrogen Safety Plan* with members of the PNNL HSP and submit a copy to the CAM.
- Evaluate the PNNL HSP's comments and determine how to address them in the final plan.
- Inform the CAM of how it will address the PNNL HSP's comments in the Final Hydrogen Safety Plan in a *Hydrogen Safety Memo*.
- Collaborate with the PNNL HSP and CAM to resolve any questions or issues pertaining to the Hydrogen Safety Plan.
- Prepare a Final Hydrogen Safety Plan.

Products:

- PNNL HSP Assessment of the Preliminary Hydrogen Safety Plan
- Hydrogen Safety Memo

TASK 4 PROCUREMENT AND BUILD

The goal of this task is to pass the Test Readiness Review (TRR) by confirming/demonstrating that the MLHSD has been built based on the results of the CDR.

The Recipient shall:

- Kick off procurement as soon as reasonably appropriate given extremely long lead times of certain LH2 componentry.
- Procure all items on the Bill of Materials released during the CDR, including the vehicle chassis.
- Retrofit the vehicle chassis with the MLHSD structure.
- Integrate the MLHSD sub-system components.

- Build all the interface connections and ensure Hardware and Software completion is achieved.
- Finalize the *Commissioning Plan* which will include the tests, procedures, and timeline to be followed in Task 5.
- Conduct TRR with internal stakeholder and with TAC members; document in *Test Readiness Review Documentation* (documentation of parts installed matching final design).

Products:

- Test Readiness Review Documentation
- Commissioning Plan

TASK 5 COMMISSIONING

The goal of this task is to publish a commissioning report, confirming all subsystems and systems on the MLHSD work as expected.

The Recipient shall:

- Collate results of sub-system component commissioning testing.
- Conduct system-level commissioning tests as set out in the Commissioning Plan.
- Notify the Certified Unified Program Agency and the CEC within 10 days of any unintended hydrogen releases or incidents to comply with the "Release and Incident Report" requirements set out in the solicitation requirements.
- Write a *Commissioning Test Report* documenting the results of the commissioning tests final inspections on Commissioned MLHSD before test campaign.
- Prepare *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Commissioning Test Report
- CPR Report #2
- Copy of the Release and Incident Report *(if applicable)*

TASK 6: SYSTEM DEPLOYMENT AND DEMONSTRATION

The goal of this task is to create a Deployment and Demonstration Test Plan and demonstrate the integrated system at an airport in a live aircraft refueling.

The Recipient shall:

- Create a *Deployment and Demonstration Test Plan* outlining the testing and analysis to be completed during the Deployment and Demonstration period. Demonstration must include, but is not limited to the following:
    - Validation testing and demonstration of MLHSD and its subsystems (safety, fuel cell, storage, and refueling demonstrations).
    - Data collection including, but not limited to the following:
        - Number, type, date, and location of refueler installed.
        - Nameplate capacity of the installed equipment, in kg/day of hydrogen.
        - Location type.

  - Total cost per refueler, the subsidy from the CEC per refueler station, federal subsidy per refueling station, utility subsidy per refueler station, and privately funded share per refueler.
  - Number of refueling sessions
  - Average MLHSD downtime
  - Average refueling session duration
  - Average amount of hydrogen (kg) dispensed
  - Refueling rate (kg/min)
  - Delivery and refueling costs ($/kg)
  - Energy consumption per unit of hydrogen refueled (kWh/kg)
- Work with the site host to achieve all permitting needed for the test and demonstrations to occur.
- Test the fully integrated and commissioned MLHSD according to the Deployment and Demonstration Test Plan.
- Before each test, conduct a test readiness meeting.
- After each test, conduct debrief meetings and review lessons learned.
- Compile a *MLHSD Test Repo*rt detailing the final test matrix, findings, and lessons learned from the testing.
- Disseminate the test report with local stakeholders before the final demonstration event.
- Prepare *Final Overall System Report* comparing project metrics achieved against target values once demonstration is complete.

Products:
- Deployment and Demonstration Test Plan
- MLHSD Test Report
- Final Overall System Report

TASK 7: EVALUATION OF PROJECT BENEFITS
The goal of this task is to report the benefits resulting from this project.

The Recipient shall:
- Complete the *Initial Project Benefits Questionnaire.* The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by December 15th of each year. The Annual Survey includes but is not limited to the following information:
  - Technology commercialization progress
  - New media and publications
  - Company growth
  - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.

- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund,* including the profile link.

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

TASK 8 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

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

The Recipient Shall:
- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the *Draft Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Technology Transfer Plan*. This document will identify:
    - TAC comments the recipient proposes to incorporate into the ***Final Technology Transfer Plan***.
    - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the ***Final Technology Transfer Plan*** to the CAM for approval.
- Implement activities identified in ***Final Technology Transfer Plan***.
- Develop and submit a ***Technology Transfer Summary Report*** that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the ***Final Technology Transfer Plan***. This report should not include any

proprietary information.

- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- Provide at least (6) six ***High Quality Digital Photographs*** (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Products:

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

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.