STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

A) New Agreement # PIR-20-002 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Peter Chen	43	916-766-0743

C) Recipient's Legal Name	Federal ID Number
CALSTART, Inc.	95-4375022

D) Title of Project
HyZET: A Design and Feasibility Study of a Fuel Cell-Powered Commercial Harbor Craft

E) Term and Amount

Start Date	End Date	Amount
3/31/2021	3/31/2024	$ 498,309

F) Business Meeting Information

☐ ARFVTP agreements $75K and under delegated to Executive Director

Proposed Business Meeting Date 3/17/2021 ☐ Consent ☒ Discussion

Business Meeting Presenter Peter Chen Time Needed: 5 minutes

Please select one list serve. Research (Energy RDD / PIER program)

Agenda Item Subject and Description:

CALSTART, Inc.

CALSTART, INC.. Proposed resolution approving agreement PIR-20-002 with CALSTART, Inc. for a $498,309.00 grant to develop an actionable hydrogen fuel cell-powered tugboat design that will be ready for construction and implementation at the Port of Los Angeles, and adopt staff's determination that this action is exempt from CEQA. The project will develop a pathway to decarbonize the marine sector by identifying and addressing challenges related to producing, delivering, transferring, and storing liquid hydrogen to power a zero-emission tugboat. (PIER NG funding) Contact: Peter Chen.

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
   ☒ Yes (skip to question 2)
   ☐ No (complete the following (PRC 21065 and 14 CCR 15378)):

   Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:
   a) ☒ Agreement **IS** exempt.
      ☐ Statutory Exemption. List PRC and/or CCR section number:
      ☐ Categorical Exemption. List CCR section number:
      ☒ Common Sense Exemption. 14 CCR 15061 (b) (3)

      Explain reason why Agreement is exempt under the above section:
      This project involves research, design, and modeling work that will result in a paper study only. The activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that

the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.

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

Check all that apply

- ☐ Initial Study
- ☐ Negative Declaration
- ☐ Mitigated Negative Declaration
- ☐ Environmental Impact Report
- ☐ Statement of Overriding Considerations

H) List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)

Legal Company Name:	**Budget**
Ballard Fuel Cell Systems Inc.	$ 0
City of Los Angeles, Harbor Department	$ 0
DNV GL USA, Inc.	$ 95,750
Chart Inc.	$ 78,750
ABB Inc.	$ 76,150
Crowley Maritime Corporation	$ 98,617

I) List all key partners: (attach additional sheets as necessary)

Legal Company Name:

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
NG Subaccount, PIERDD	19-20	501.001N	$498,309

R&D Program Area: EGRO: Transportation TOTAL: $ 498,309

Explanation for “Other” selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Piero Stiillitano

Address: 48 S Chester Ave

City, State, Zip: Pasadena, CA 91106-3105

Phone: 626-744-5608

E-Mail: pstillitano@calstart.org

2. Recipient’s Project Manager

Name: Kristian Jokinen

Address: 48 S Chester Ave

City, State, Zip: Pasadena, CA 91106-3105

Phone: 626-744-5679

E-Mail: kjokinen@calstart.org

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-20-604

☐ First Come First Served Solicitation Solicitation #:

M) The following items should be attached to this GRF

1.	Exhibit A, Scope of Work		☒ Attached
2.	Exhibit B, Budget Detail		☒ Attached
3.	CEC 105, Questionnaire for Identifying Conflicts		☒ Attached
4.	Recipient Resolution	☒ N/A	☐ Attached
5.	CEQA Documentation	☐ N/A	☒ Attached

Peter Chen — 1/26/2021
Agreement Manager **Date**

Jonah Steinbuck — 1/26/21
Office Manager **Date**

Linda Spiegel — 1/26/2021
Deputy Director **Date**

Exhibit A
Scope of Work
CALSTART, Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR [1]	Task Name
1		General Project Tasks
2		Development of Baseline Representative of the Current Commercial Harbor Craft Market
3		Evaluation of Hydrogen Fuel Cell System Technology and Integration
4	X	Development of Actionable Fuel Cell-Powered Harbor Craft Design and Safety Requirements
5		Analysis of Economic Feasibility
6		Development of a Detailed Cost-Benefit Analysis
7		Identification of Technology and Regulatory Barriers
8	X	Development of Supporting Plans for Refueling Infrastructure
9		Evaluation of Project Benefits
10		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AHJ	Authority Having Jurisdiction
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
DE	Diesel Electric
GHG	Greenhouse Gas
HAZID	Hazard Identification
HSP	Hydrogen Safety Panel
IMO	International Maritime Organization
LH2	Liquid Hydrogen
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to conduct an actionable design and feasibility study that can be used to develop a construction and deployment-ready, fuel cell-powered tug.

[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

Maritime transportation accounts for nearly 2.5% of global GHG emissions, and initiatives like the International Maritime Organization's (IMO) strategy on reduction of emissions has determined targets for reduction of emissions in the industry, but significant development is required to achieve a reliable, safe, and cost effective source of power equivalent to diesel engines. The maritime industry is exploring options to eliminate emissions, and liquid hydrogen (LH2) is one of the most promising. While LH2 has been used for years in specific land-based industries, it has not been tested to scale in the maritime industry. Further, marine-ready fuel cells and LH2 storage has only recently become available, and cost remains a barrier for all industries seeking to decarbonize with hydrogen.

Solution

The project team will develop a design for a hydrogen fuel cell-powered tugboat for operation at the Port of Los Angeles. This project team will seek support from other stakeholders to contribute to the overall design process and supporting plans for refueling infrastructure. This collaboration will focus on laying the necessary groundwork to build and place a fuel cell-powered tugboat in operation including baseline development, vessel design, equipment specification, economic analysis, technology and regulatory barrier identification, and infrastructures.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Advance technologies with potential to reduce maritime GHG and air pollutant emissions.
- Identify and address technical, safety, and regulatory challenges for hydrogen-powered tugboats.
- Develop an industry-standard design that will be relevant to the tugboat and applicable to other uses to reduce costs for future projects.

Ratepayer Benefits: This Agreement will develop an actionable hydrogen harbor craft design that can increase hydrogen demand and help lower the price of hydrogen while reducing air pollutant emissions for under-resourced communities surrounding California ports. Reducing hydrogen costs and accelerating scaled production can assist other difficult-to-abate sectors that are seeking to decarbonize using hydrogen. These sectors include on-road heavy transport, industrial process, and the natural gas system.

Technological Advancement and Breakthroughs: This Agreement will help to achieve the State of California's statutory energy goals by accelerating the decarbonization of the maritime sector. Through this project, the team will identify challenges and barriers to the use of hydrogen powered tugboats. The partners in this Agreement are industry leaders that are well positioned to leverage the learnings from this Agreement to deploy hydrogen powered tugboats. This Agreement will address barriers to successfully using hydrogen fuel cells in the maritime industry including fuel storage, fuel handling, and lack of consolidated regulations.

Agreement Objectives

The objectives of this Agreement are to:

- Develop a baseline harbor craft design including detailed specifications and costs. These detailed specifications will be used to inform the fuel cell-powered harbor craft design and future deployment.
- Evaluate the costs of constructing, operating, and maintaining the fuel cell-powered harbor craft when compared to the baseline vessel.
- Develop a cost-benefit analysis to estimate and compare emissions reduction potential with other solutions.
- Identify technology and regulatory barriers to using hydrogen fuel cell systems in the maritime industry.
- Develop supporting plans for refueling infrastructure, including analysis of hydrogen production and delivery pathways.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** 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 Energy Commission's software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick or CD-ROM.

    The following describes the accepted formats for electronic data and documents provided to the Energy Commission 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.
    - Documents intended for public distribution will be in PDF file format.
    - The Recipient must also provide the native Microsoft file format.
    - 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 Energy Commission'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 Energy Commission 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;
  - 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 and invoices (subtask 1.5);
  - Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and

- Any other relevant topics.

- Provide an *Updated Project Schedule, List of Match Funds,* and *List of Permits*, 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:
- Updated Project Schedule *(if applicable)*
- Updated List of Match Funds *(if applicable)*
- Updated List of Permits *(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 Energy Commission 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 Energy Commission 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 Energy Commission.

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 Energy Commission, 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 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.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- 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* and 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)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- 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 Energy Commission 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 state-owned equipment.
  - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
  - The Energy Commission'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 *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary *(if applicable)*
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written 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 Fund 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. The CAM will review the Final Report, which will be due at least **five months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use the 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 *Style Manual* provided by the CAM. *(See Task 1.1 for requirements for draft and final products.)*

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- 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, 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)
    - Ensure that the document is written in the third person.
    - Ensure that the Executive Summary is understandable to the lay public.
        - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
        - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
        - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
    - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
    - Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
    - Include a brief description of the project results in the Abstract.
- 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
- Consider incorporating all CAM comments into the Final Report. 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 Final Report 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.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

- Final Report (draft and final)
- Written Responses to Comments on the Draft 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 Energy Commission 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 Energy Commission 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 Energy Commission 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 no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
    - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
    - The schedule the Recipient will follow in applying for and obtaining the permits.

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

Products:

- Permit Status Letter
- Updated List of Permits *(if applicable)*
- Updated Schedule for Acquiring Permits *(if applicable)*

- Copy of Each Approved Permit *(if applicable)*

Subtask 1.9 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 the 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.

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.

Products:

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

IV. TECHNICAL TASKS

TASK 2: DEVELOPMENT OF BASELINE REPRESENTATIVE OF THE CURRENT COMMERCIAL HARBOR CRAFT MARKET

The goal of this task is to develop a baseline that is representative of the current commercial harbor craft market in California. The baseline will include detailed specifications including engine model, vessel characteristics, typical routes and duty cycles, fuel consumption, capital costs, and operating and maintenance costs.

The Recipient shall:

- Develop a baseline that is representative of the current commercial harbor craft market in California.
- Prepare a *Baseline Harbor Craft Report* that outlines the baseline harbor craft including the engine model, vessel characteristics, typical routes and duty cycles, fuel consumption, capital costs, and operating and maintenance costs.

Products:

- Baseline Harbor Craft Report (draft and final)

TASK 3: EVALUATION OF HYDROGEN FUEL CELL SYSTEM TECHNOLOGY AND INTEGRATION

The goal of this task is to evaluate hydrogen fuel cell system technology and integration options as a zero-emission alternative to the baseline. Analyze the technical feasibility of using hydrogen fuel cells to meet the power, range, endurance, and reliability demands of the baseline.

The Recipient shall:

- Conduct a comparative lifecycle analysis for seven different standard propulsion arrangements (Diesel Mechanical, Shaft Generator, Diesel Electric [DE], DE with Battery, DE with Battery and Shore Charging, Battery Electric, and Fuel Cell Electric). Consider various aspects including capital and operating costs, equipment size/weight, emissions, and maintenance.
- Seek input from the project team as necessary to ensure assumptions and inputs are in line with actual operating parameters for this profile. Work with partners to perform a preliminary reliability study of key equipment.
- Assess power and energy requirements for the hybrid drive propulsion system.
- Propose the optimal power for fuel cell power plant, power and energy for battery energy storage system, and fuel capacity requirements.
- Evaluate a modular fuel cell power plant consisting of a multiplicity of sub-megawatt modules vs several megawatt-scale modules.
- Determine necessary subsystems to support the fuel cell hybrid drive system, and rough sizing for each, including cooling systems, electrical power conversion, automation and control, plumbing components for fuel, and low voltage electrical systems.
- Prepare a *Hydrogen Fuel Cell System Technology and Integration Report* that includes, but is not limited to:
    - Summary of key performance elements considered from the baseline harbor craft, such as vessel range, operating profile, power output, and propulsor).
    - Comparison of propulsion system arrangements for a tugboat including rough equipment design, sizing, and costs.
    - General description of fueling options including Liquid Hydrogen (LH2).

- Description of fuel cell power plant options and supporting subsystems.

Products:

- Hydrogen Fuel Cell System Technology and Integration Report (draft and final)

TASK 4: DEVELOPMENT OF ACTIONABLE FUEL CELL-POWERED HARBOR CRAFT DESIGN AND SAFETY REQUIREMENTS

The goal of this task is to develop actionable fuel cell-powered harbor craft design that will be ready for construction and deployment with additional funding. Size the fuel cell system, balance of plant, and onboard storage systems to meet the performance needs of the baseline. Consider safety requirements mandated by industry codes and standards and appropriate regulations, and other unique design requirements for the vessel.

The Recipient shall:

- Provide necessary details of its scope of equipment including sizes, weights, drawings, and system pricing.
- Develop a concept level package suitable for submittal to shipyards to obtain preliminary construction pricing. The package will contain details of the propulsion system based on input from the consortium, as well as outfit items based on internal discussions with tugboat operator personnel.
- Map the regulatory scenario to provide guidance on the regulatory process required for the hydrogen tugboat.
- Specify LH2 tank storage and fuel cell equipment based on the vessel's operational profile.
- Monitor the evolution of the design and provide technical expertise and advice on regulatory framework.
- Design and determine the component placement and interconnection for drive system components within the vessel.
- Develop preliminary design of fuel system including selection of critical equipment for fuel storage, transfer, and temperature control, and onboard arrangement.
- Develop preliminary design of cooling system components for fuel cell, battery, and electric drive components, and thermal management systems for fuel storage.
- Design fuel cell process air filtration and supply system, and exhaust system.
- Conduct an initial assessment of vessel stability and seaworthiness.
- Prepare a *Fuel Cell-Powered Harbor Craft Design and Safety Report* that includes, but is not limited to:
    - Outline of specifications, general arrangements, preliminary hazardous zone plane, preliminary stability, and electrical one-line diagrams.

    - Preliminary regulatory map focused on specific safety requirements for operating the fuel cell-powered harbor craft in the U.S. with U.S. Coast Guard approval.
- Prepare *CPR Report #1* in accordance with Subtask 1.3 CPR Meetings.
- Participate in CPR meeting #1.

Products:
- Fuel Cell-Powered Harbor Craft Design and Safety Report (draft and final)
- CPR Report #1

TASK 5: ANALYSIS OF ECONOMIC FEASIBILITY
The goal of this task is to analyze economic feasibility by evaluating costs of constructing, operating, and maintaining the fuel cell-powered harbor craft compared to the baseline.

The Recipient shall:
- Assess component costs for all drive and fuel storage components and associated subsystems.
- Estimate costs for detailed design for manufacture and manufacturing costs.
- Estimate service costs for scheduled and unscheduled maintenance.
- Estimate operating costs including fuel consumption and associated labor for fueling and drive operation.
- Analyze economic feasibility under potential carbon tax scenarios.
- Prepare an *Economic Feasibility Analysis Report* that compares and evaluates the costs of constructing, operating, and maintaining the fuel cell-powered harbor craft compared to a representative baseline.

Products:
- Economic Feasibility Analysis Report (draft and final)

TASK 6: DEVELOPMENT OF A DETAILED COST-BENEFIT ANALYSIS
The goal of this task is to conduct a detailed cost-benefit analysis to compare the life cycle effectiveness of hydrogen fuel cells at reducing GHG and air pollutant emissions with other advanced emission reduction technologies and fuels that may include, but is not limited to U.S. Environmental Protection Agency Tier 4 marine diesel engines, liquefied natural gas, hybridization, battery electric, hydrogen carriers, and high temperature fuel cells.

The Recipient shall:
- Obtain data for fuel consumption for similar vessels, including baseline vessel.
- Obtain operational data from group members to estimate typical number of operations for a similar tug use in a year.

- Combine received data to estimate yearly greenhouse gas emissions for a similar vessel operating on diesel engine.
- Identify other solutions for reduction of emissions being used in the industry and perform qualitative evaluation of potential for use in the tug market.
- Utilize data obtained in this study to estimate the potential for emission reduction when utilizing alternative fuels. This task will focus on those fuels currently in being utilized in the industry (liquified natural gas, biofuels, marine diesel oil, etc.), as well as alternative arrangements (battery and hybrids).
- Obtain cost estimates for (conversion and/or operation) of a tug to these alternative fuels/sources of power if information is available in the industry.
- Evaluate GHG reduction potential from other harbor craft and vessels with similar operational profiles.
- Prepare a *Cost-Benefit Analysis Report* that compares challenges, estimated costs, and potential for GHG and air pollutant reductions for different solutions available in the industry, including the configuration with hydrogen fuel cells.

Products:

- Cost-Benefit Analysis Report (draft and final)

TASK 7: IDENTIFICATION OF TECHNOLOGY AND REGULATORY BARRIERS

The goal of this task is to identify technology and regulatory barriers related to hydrogen fuel cell systems. Determine potential strategies, such as future research and development, to overcome these barriers.

The Recipient shall:

- Initiate a qualitative desktop review of design documentation, including drawings and calculations.
- Verify compliance to applicable regulations as identified in the regulatory map.
- Where applicability of regulations is not clear, DNV GL will indicate if complying can improve safety of operation.
- Utilize findings from desktop review and professional expertise from DNV GL team to create a preliminary list of hazards.
- Organize workshops with the project team and a variety of stakeholders including but not limited to regulatory agencies, port authorities, classification societies, hydrogen safety experts, and fleets to discuss preliminary list of hazards and identify other potential challenges.
- Conduct preliminary risk assessment utilizing Hazard Identification (HAZID) techniques.
- Identify actions that could be taken to mitigate the identified risks.
- Report on conclusions from the workshop and recommend on next steps, which could include additional safety measures, redesign, or introduction of new technologies.

- Prepare a *Technology and Regulatory Barriers Report* that includes a high-level gap assessment, pre-HAZID findings, guidance on the alternative design process, workshop conclusions, and recommended next steps.

Products:

- Technology and Regulatory Barriers Report (draft and final)

TASK 8: DEVELOPMENT OF SUPPORTING PLANS FOR REFUELING INFRASTRUCTURE

The goal of this task is to perform technology assessment of bunkering technology and develop supporting plans for refueling of infrastructure solutions, and an economic analysis with the goal of informing future deployment with additional funding.

The Recipient shall:

- Identify solutions that can be used for bunkering of LH2 to the hydrogen tugboat, indicating when technology has not been verified for this application.
- Perform a technical evaluation and select the most feasible technology based on technology maturity, safety aspects, and capacity for meeting technical specifications.
- Prepare a *Technology Assessment Report* based on DNV GL's Technology Qualification Program that describes the process and results of the following:
    - Specify and evaluate a list of technology solutions for bunkering LH2.
    - Determine qualification basis based on technical specifications and functional requirements for the technology including compliance, safety, reliability, and availability.
    - Perform technology categorization, identifying what are the new and unproven aspects of the technology based on application and maturity.
    - Perform a preliminary risk assessment to identify main hazards for bunkering utilizing this technology.
- Develop supporting plans including an analysis of hydrogen production and delivery pathways to the port.
- Identify existing hydrogen production facilities around the port complex and future projects that can support the tugboat deployment.
- Prepare a *Hydrogen Feasibility Roadmap* for the port that identifies potential hydrogen demand for various harbor craft deployment scenarios along with projected emissions reductions.
- Prepare *CPR Report #2* in accordance with Subtask 1.3 CPR Meetings.
- Participate in CPR meeting #2.

Products:

- Technology Assessment Report (draft and final)
- Hydrogen Feasibility Roadmap (draft and final)

- CPR Report #2

TASK 9: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:

    - For Product Development Projects and Project Demonstrations:
        - Published documents, including date, title, and periodical name.
        - Estimated or actual energy and cost savings and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
        - Greenhouse gas and criteria emissions reductions.
        - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
        - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
        - A discussion of project product downloads from websites, and publications in technical journals.
        - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
        - Additional Information for Product Development Projects:
            - Outcome of product development efforts, such copyrights and license agreements.
            - Units sold or projected to be sold in California and outside of California.
            - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
            - Investment dollars/follow-on private funding as a result of Energy Commission funding.
            - Patent numbers and applications, along with dates and brief descriptions.

- Additional Information for Product Demonstrations:
  - Outcome of demonstrations and status of technology.
  - Number of similar installations.
  - Jobs created/retained as a result of the Agreement.

- For Information/Tools and Other Research Studies:
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
  - A discussion of project product downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:
- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

TASK 10: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:
- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:

  - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
  - A description of the intended use(s) for and users of the project results.
  - Published documents, including date, title, and periodical name.
  - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
  - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
  - The number of website downloads or public requests for project results.
  - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- 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.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 21-0317-6b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: CALSTART, 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-20-002 with CALSTART, Inc. for a $498,309 grant to develop an actionable hydrogen fuel cell-powered tugboat design that will be ready for construction and implementation at the Port of Los Angeles. The project will develop a pathway to decarbonize the marine sector by identifying and addressing challenges related to producing, delivering, transferring, and storing liquid hydrogen to power a zero-emission tugboat; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her 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 March 17, 2021.

AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Patricia Carlos
Secretariat