STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

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

A) New Agreement # PIR-21-002 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Peter Chen	43	916-776-0743

C) Recipient's Legal Name	Federal ID Number
Institute of Gas Technology dba Gas Technology Institute	36-2170137

D) Title of Project
Symbio H2 Central Valley Express

E) Term and Amount

Start Date	End Date	Amount
4/1/2022	2/28/2025	$ 1,999,667

F) Business Meeting Information

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

Proposed Business Meeting Date 3/9/2022 ☐ Consent ☒ Discussion

Business Meeting Presenter Peter Chen Time Needed: 5 minutes

Please select one list serve. NaturalGas (NG Research Program

Agenda Item Subject and Description:
INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE
Proposed resolution approving agreement PIR-21-002 with Institute of Gas Technology dba Gas Technology Institute for a $1,999,667 grant to develop an advanced high-power fuel cell system, improve the hydrogen-to-system mass ratio of an onboard hydrogen storage system, and demonstrate low rolling resistance tires in a high-torque electric vehicle application, and adopting staff's determination that this action is exempt from CEQA. These technologies will be integrated onto a Class 8 truck and demonstrated over 12 months in drayage operations and a challenging regional haul route between the Inland Empire and Northern San Joaquin Valley. (Gas R&D Program 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:
      Cal. Code Regs., tit. 14, § 15306; Cal. Code Regs., tit 14, § 15301
      ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

This project is exempt under Cal. Code Regs., tit. 14, section 15306 because it primarily focuses on information collection efforts related to the design and use of an advanced hydrogen fuel cell truck. Key subsystems such as a fuel cell system, hydrogen storage system, and low rolling resistance tires will be assembled onto a chassis, and the assembled truck will be driven for demonstration and data collection purposes. Telematics systems will be installed on the truck and operational data on performance and energy usage will be collected; this is the primary purpose of the project. Data will then be analyzed within existing laboratory and industrial environments. For these reasons, this project will have no significant effect on the environment and fits within section 15306.

This project is also exempt under Cal. Code Regs., tit. 14, section 15301 because work will be conducted at existing facilities. Specifically, a truck chassis will be purchased and modified at an existing industrial facility in Carlsbad. The modified truck will be primarily operated out of an existing freight facility in Fontana, and will move goods throughout the Greater Los Angeles region and across the Central Valley. For these reasons, the project will have no significant effect on the environment and fits within section 15301.

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**
Frontier Energy, Inc.	$ 50,000
Michelin North America	$ 0 (Match only)
Clarion Corporation of America	$ 0 (Match only)
Premium Transportation Services, Inc.	$ 0 (Match only)
Symbio North America Corporation	$ 1,558,955
Ricardo, Inc.	$ 15,000

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	20-21	501.001O	$1,999,667
			$

R&D Program Area: EGRO: Transportation TOTAL: $ 1,999,667

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Kate Jauridez

Address: 1700 S Mount Prospect Rd

City, State, Zip: Des Plaines, IL 60018-1804

Phone: 847-768-0905

E-Mail: kjauridez@gti.energy

2. Recipient's Project Manager

Name: Bart Sowa

Address: 1700 S Mount Prospect Rd

City, State, Zip: Des Plaines, IL 60018-1804

Phone: 847-768-5517

E-Mail: bsowa@gti.energy

L) Selection Process Used

- ☒ Competitive Solicitation Solicitation #: GFO-21-501
- ☐ First Come First Served Solicitation Solicitation #:
- ☐ Non-Competitive Bid Follow-on Funding (SB 115)

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

Agreement Manager **Date**

Office Manager **Date**

Deputy Director **Date**

Exhibit A
Scope of Work
Gas Technology Institute

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Vehicle Design, Build and Verification
3		Vehicle Demonstration and Data Collection
4		Evaluation of Project Benefits
5		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAD	Computer Aided Design
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
TAC	Technical Advisory Committee
TCO	Total Cost of Ownership

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 of a Class 8 (gross vehicle weight rating exceeding 33,000 lbs) fuel cell truck integrated with a pre-commercial hydrogen fuel cell power system, onboard hydrogen storage system, and low rolling resistance tires. The project will demonstrate the truck on challenging regional haul operations in California over 12 months.

B. Problem/ Solution Statement

Problem
Extended regional highway freight routes pose significant challenges to zero-emission trucks given the demanding energy and power required to meet the duty cycle. Common barriers to wider adoption include: range anxiety and inadequate performance; insufficient fueling infrastructure; limited service and maintenance support; high total cost of ownership (TCO); and inadequate private sector investment. A zero-emission powertrain with comparable performance to a traditional powertrain is needed to address challenging duty cycles in order to support California's goal to transition to 100 percent zero-emission heavy duty vehicles.

[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.

Solution
The Recipient will develop a Class 8 fuel cell truck equipped with a hydrogen fuel cell power system and corresponding high-pressure hydrogen onboard storage tanks that are optimized to provide sufficient energy and power to meet challenging regional haul operations as a one-to-one replacement for a diesel truck. The proposed technology will reduce the known barriers to adoption.

C. Goals and Objectives of the Agreement

Agreement Goals
The goals of this Agreement are to:

- Develop a Class 8 fuel cell truck that can meet challenging regional haul operations as a one-to-one replacement for a diesel truck.
- Integrate a pre-commercial hydrogen fuel cell power system, onboard hydrogen storage system, and low rolling resistance tires.
- Demonstrate the Class 8 fuel cell truck in real world operation to verify performance and validate design improvements.
- Reduce TCO by 30 percent to encourage adoption.
- Improve performance, durability, and maintainability of a regional-haul fuel cell truck.

Ratepayer Benefits: This Agreement will result in the ratepayer benefits of increased renewable hydrogen demand and greenhouse gas emissions reduction by demonstrating a proof-of-concept technology that can stimulate broader commercial adoption of hydrogen fuel cells for heavy-duty trucks. The demonstration vehicle will displace an estimated 17,000 gallons of diesel, 127 tons of carbon dioxide (CO_2) emissions, and 64.4 kg of oxides of nitrogen (NOx) emissions over 12 months. Additional benefits include knowledge transfer and workforce development in under-resourced communities located around the planned demonstration.

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 integrating a high-power fuel cell module, high pressure hydrogen storage, and next-generation low rolling resistance tires into a Class 8 heavy-duty vehicle. The truck will be one of the first zero-emission vehicles capable of completing a challenging regional-haul route connecting Southern and Northern California. The vehicle will have adequate power and range to replace a diesel truck equipped with a 15-liter engine serving the route.

Agreement Objectives
The objectives of this Agreement are to:

- Design, build, and demonstrate for twelve months a hydrogen fuel cell, zero-emission regional haul Class 8 truck.
- Operate the truck for 12 months, while collecting energy, performance, operational and maintenance data.
- Demonstrate the ability to achieve 25,000 hours or 10 years / 1,000,000 miles fuel cell system lifetime.
- Achieve a TCO reduction of 30 percent compared to current fuel cell vehicle technology.
- Achieve an 8 percent storage system – hydrogen mass ratio to demonstrate the ability to have cargo capacity parity with diesel trucks.

- Demonstrate energy consumption reductions using pre-production low rolling resistance in a zero-emission truck application.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

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

For products that require a final version only

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

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

    - **Electronic File Format**
        - Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the California Energy Commission's (CEC) software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick.

The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**

  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open-source programs:

  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Administrative products (subtask 1.1);

- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

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

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

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

The CAM shall:

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

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the

CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the CEC, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

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

The CAM shall:

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

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda
- 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 Energy Commission 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:
- Draft Final Report
- Summary of TAC Comments on 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 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 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:
- 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.
- 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:

- 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 from 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

Exhibit A
Scope of Work
Gas Technology Institute

IV. TECHNICAL TASKS

TASK 2: VEHICLE DESIGN, BUILD AND VERIFICATION

The goal of this task is to design, build and verify the assembly and functionality of a prototype vehicle.

Subtask 2.1: Functional Specification and Preliminary Design

The goal of this subtask is to develop a detailed functional specification and preliminary design of the overall system architecture and package concepts for the truck.

The Recipient shall:

- Review functional requirements such as vehicle performance, range and environmental conditions, chassis/cab configuration.
- Conduct a preliminary duty cycle analysis to calculate power and energy requirements.
- Perform design calculations for major components such as fuel cell modules, energy storage, propulsion system, accessory system, and cooling components.
- Obtain and review target truck chassis designs to map and document mechanical and electrical interfaces to the vehicle controls, dashboard displays, safety interlocks including Controller Area Network messages and discrete signals.
- Identify and document required modifications to the truck chassis.
- Prepare *Detailed Functional Specification Report* that includes, but is not limited to the following:
    - Analysis of high-resolution duty cycle data collected with dataloggers on baseline diesel truck.
    - Estimate of power and energy storage requirements to meet performance and range targets.
    - Assessment of wheelbase, cab and component packaging tradeoffs, and compatibility with legacy diesel truck architectures.
    - Summary of environmental requirements, such as ambient temperature, humidity, and elevation.
- Develop a *Preliminary Fuel Cell Truck Design Report* including overall system architecture and hardware layout and package concepts for components as follows:
    - Fuel cell
    - Hydrogen storage system
    - Traction motor
    - Energy storage
    - Accessory and subsystems
    - Thermal management systems
    - Electrical and mechanical subsystems layout
    - Control software design
    - Safety design
    - Preliminary engineering bill of materials that describes components included in the preliminary design
- Prepare *CPR Report #1* in accordance with Subtask 1.3 and participate in CPR Meeting.

Products:

- Detailed Functional Specification Report (draft and final)
- Preliminary Fuel Cell Truck Design Report (draft and final)
- CPR Report #1

Subtask 2.2: Preliminary Design Review, Long Lead Procurement and Design Updates
The goal of this subtask is advance the design of the fuel cell truck, and to procure long lead time components.

The Recipient shall:

- Conduct a mechanical, electrical, and software design review of the fuel cell truck to ensure the design will meet the goals and technical requirements of the project.
- Prepare *Preliminary Design Review Report* that discusses, but is not limited to the following design documents:
  - 3D computer aided design (CAD) models and mechanical drawings of key components.
  - Single line drawings and electrical schematics.
  - Mechanical block diagrams.
  - Control software logic diagrams.
- Generate and release *Purchase Orders* for long lead time components identified in the preliminary engineering bill of materials and design documents, such as the following:
  - Traction drive motor
  - Fuel cell system
  - Battery energy storage system
  - Low rolling resistance tires
  - Hydrogen storage tanks
  - Truck chassis
- Advance the truck design items such as the packaging design of major powertrain and electrical system components based on updates and inputs from the Preliminary Design Review.
- Update the design documents for the major components based on the Preliminary Design Review recommendations and feedback from vendors following the procurement process.
- Complete preliminary electrical design package for the following:
  - High voltage wiring
  - Low voltage wiring
  - Safety and protection hardware and software
  - CAD models for electrical system
- Develop the preliminary control strategy including the design of the overall system control hardware and software.
- Complete *Preliminary System Control Design Report* that includes, but is not limited to the following:
  - Summary of updated design documents and preliminary electrical design package.
  - Summary of control interfaces.
  - Description of control strategy including the overall system control hardware and software.

Products:

- Preliminary Design Review Report (draft and final)
- Purchase Orders
- Preliminary System Control Design Report (draft and final)

Subtask 2.3: Safety Analysis and Hydrogen Safety Plan
The goal of this subtask is to complete the safety analysis for the fuel cell truck to ensure the trucks will comply with performance and safety requirements.

The Recipient shall:

- Conduct safety analysis and prepare a *Safety Analysis Report* that includes, but is not limited to an analysis of the following:
  - Failure Mode and Effects Analysis (FMEA)
  - Hazard and Operability Analysis (HAZOP)
  - Federal Motor Vehicle Safety Standards (FMVSS) compliance assessment
- Prepare a *Hydrogen Safety Plan* that considers the *Safety Analysis Report* and includes, but is not limited to the following:
  - A description of the Recipient's work and activities to ensure safety, the unique technologies being demonstrated, and the evaluation results of any hazard analysis performed.
  - A description about how the Recipient will adhere to the most recent public guidelines, such as those published by the Pacific Northwest National Laboratory Hydrogen Safety Panel for safety planning for hydrogen and fuel cell projects.
  - A description about how the Recipient will conform to the most current version of the National Fire Protection Association (NFPA) 2, as applicable to the vehicle design.
  - A description about how the Recipient will provide safety training for all operators to conduct the demonstration.

Products:

- Safety Analysis Report (draft and final)
- Hydrogen Safety Plan (draft and final)

Subtask 2.4: Detailed Drawings and Final Design Review
The goal of this subtask is to complete the design documents (mechanical and electrical) for the fuel cell truck based on the inputs of the previous process tasks and to develop the final design review documents.

The Recipient shall:

- Develop final design review documents including final mechanical and electrical detailed drawings.
- Develop meeting agenda for final design review.
- Conduct an internal final design review meeting to review and approve the mechanical, electrical and control designs for the fuel cell truck.
- Document meeting results in *Final Design Review Status Report*.
- Prepare *Final Design Review Status Report* that includes, but is not limited to:
  - Final detailed drawings of the mechanical and electrical designs.
  - Project partner recommendations and feedback on the final mechanical, electrical, and control designs.

Products:

- Final Design Review Status Report (draft and final)

Subtask 2.5: Major Systems Fabrication, Commissioning and Final Assembly
The goal of this subtask is to manufacture the major truck system subassemblies commission the subassemblies off-vehicle, and perform the final assembly of the subsystems on-vehicle.

The Recipient shall:

- Manufacture the structural cradles to host major subcomponents for easy integration into the vehicle chassis.
- Manufacture the thermal management systems.
- Manufacture battery energy storage system.
- Manufacture the hydrogen fuel storage system.
- Build mechanical system plumbing.
- Build electrical subsystems.
- Update engineering drawing package.
- Verify mechanical, electrical and control system integrity.
- Perform leak checks and insulation tests.
- Perform initial power-up tests.
- Commission fuel cell power system and major subsystems.
- Conduct controller code updates and safety verification tests.
- Conduct an internal drive system review.
- Document required changes to systems, subsystems, and components.
- Install fuel cell electric drive propulsion system.
- Install hydrogen fuel storage system.
- Install battery energy storage system.
- Install low and high voltage power system cabling and wiring.
- Install hydrogen tanks.
- Prepare *Final Assembly Report* including, but not limited to the following:
  - High quality digital photographs of the installed systems.
  - Summary of the final assembly process.
  - Description of mechanical and electrical interface connections used for final assembly.
  - Summary of lessons learned and recommendations for future design improvements

Products:

- Final Assembly Report (draft and final)

Subtask 2.6: Vehicle Commissioning and Validation
The goal of this subtask is to perform vehicle commissioning checks and validate the vehicle performance and quality of assembly.

The Recipient shall:

- Verify functionality of safety systems, startup, and shutdown sequences in-vehicle that include but are not limited to:
  - Fuel cell power system
  - Hydrogen fuel storage system
  - Battery energy storage system

  - Control system
  - Propulsion system
- Troubleshoot remaining issues, if any, and commission the fuel cell truck.
- Conduct validation and factory acceptance tests including road tests.
- Conduct pre-ship performance validation.
- Obtain engineering and quality sign-off and authorization to release truck to customer.
- Deliver vehicle to demonstration fleet location.
- Prepare *Commissioning and Validation Report* including, but not limited to the following:
  - High quality digital photographs documenting the commissioning process
  - Functional verification summary
  - Summary of vehicle validation testing results
- Prepare *CPR Report #2* in accordance with Subtask 1.3 and participate in CPR Meeting.

Products:
- Commissioning and Validation Report (draft and final)
- CPR Report #2

TASK 3: DEMONSTRATION AND DATA COLLECTION
The goal of this task is to operate the vehicle in revenue service for 12 months and collect the vehicle performance and operational data.

Subtask 3.1: Training and Orientation
The goal of this subtask is to provide training to drivers and maintenance personnel prior to the demonstration phase.

The Recipient shall:
- Conduct formal training session(s) for drivers and maintenance personnel in classroom and hands-on settings covering the following:
  - Knowledge on power system architecture
  - Hydrogen fueling process
  - Preventive maintenance
  - Safety protocols
- Issue Training Certification Document to trained personnel.
- Obtain sign-off and release truck to demonstration fleet for in-service operations.
- Prepare *Vehicle Training Report* that includes, but is not limited to the following:
  - Training certification document issued to trained personnel.
  - Summary of information covered in the formal training sessions.
  - Feedback from drivers and maintenance personnel on the training.
  - Recommendations for improvement and wider implementation to further educate the workforce on hydrogen fuel cell technology.

Products:
- Vehicle Training Report (draft and final)

Exhibit A
Scope of Work
Gas Technology Institute

Subtask 3.2: Telematics Installation, Demonstration, Data Collection and Monitoring
The goal of this subtask is to install telematics, demonstrate the fuel cell truck and a baseline diesel truck, monitor performance, and collect data.

The Recipient shall:

- Develop *Demonstration Data Collection Plan* including, but not limited to the following:
  - Description of telematics system installed onto the fuel cell truck and baseline diesel truck.
  - Procedures for collecting, measuring, and evaluating all data collected for the demonstration.
  - List of parameters that will be collected over the demonstration.
  - Description of routes and schedule of progression to address more challenging duty cycles.
  - Description of fueling strategy and schedule to support the demonstration.
- Install telematics system in the fuel cell truck and baseline diesel truck.
- Troubleshoot any issues identified.
- Provide service support personnel and call hotline for rapid response.
- Identify key service point of contact from vehicle fleet and technology providers.
- Confirm fueling schedule with fuel suppliers.
- Demonstrate fuel cell truck on short drayage routes to allow drivers to get familiar with vehicle capabilities, fueling process, and gain confidence in range and reliability.
- Demonstrate fuel cell truck in progressively longer range and more challenging routes representative of extended regional haul operations in California.
- Collect data from telematics system for 12 months for the fuel cell truck and 1 month for the baseline diesel truck. The data collected will include, but will not be limited to:
  - Vehicle and powertrain specifications including manufacturer, gross vehicle weight, fuel capacity, battery capacity, and rated power.
  - Vehicle operation including duty cycle, descriptions of daily usage, average speed, payload weight when available, trip duration, and trip distance.
  - Vehicle performance including maintenance information, vehicle availability, vehicle range, fuel cell degradation.
  - Fuel consumption including fuel price, refueling time, distance traveled to refuel, refueling source, refueling frequency, and energy efficiency.
  - Fleet experience including qualitative comparisons with other vehicle technologies, remaining gaps or barriers to adoption, and operator feedback.
  - Drivers reports.
  - Maintenance records.
- Include demonstration data in regular monthly *Progress Reports* per Subtask 1.5 for a period of 12 months.

Products:

- Demonstration Data Collection Plan (draft and final)

Subtask 3.3: Demonstration Data Analysis and Reporting
The goal of this subtask is to analyze the collected data to calculate economic and environmental impacts.

The Recipient shall:

- Combine and summarize the data collected over the 12-month demonstration.
- Calculate the projected TCO with a detailed breakdown of capital, operating, and maintenance costs associated with the vehicles.
- Calculate the projected fuel cell system durability based on degradation over the demonstration period.
- Evaluate and analyze energy efficiency benefits using conventional and low rolling resistance tires.
- Generate key performance indicators.
- Analyze technology benefits, shortfalls, and recommendations on how to mitigate the shortfalls.
- Visualize data by organizing in tables, figures, and graphs.
- Prepare *Demonstration Data Report* that addresses the activities described in this subtask.

Products:

- Demonstration Data Report (draft and final)

TASK 4: 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.

Exhibit A
Scope of Work
Gas Technology Institute

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 5: 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 (Draft/Final)* 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 an 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 (Draft/Final)* 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/Final)
- Summary of TAC Comments
- Technology Transfer Summary Report (Draft/Final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 22-0309-13b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: INSTITUTE OF GAS TECHNOLOGY DBA GAS TECHNOLOGY INSTITUTE.

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-21-002 with Institute of Gas Technology dba Gas Technology Institute for a $1,999,667 grant to develop an advanced high-power fuel cell system, improve the hydrogen-to-system mass ratio of an onboard hydrogen storage system, and demonstrate low rolling resistance tires in a high-torque EV application. These technologies will be integrated onto a Class 8 truck and demonstrated over 12 months in drayage operations and a challenging regional haul route between the Inland Empire and Northern San Joaquin Valley; 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 March 9, 2022.
AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Liza Lopez
Secretariat