STATE OF CALIFORNIA
GRANT REQUEST FORM (GRF)
CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

A) New Agreement # EPC-20-005 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Robin Goodhand		916-776-0766

C) Recipient's Legal Name	Federal ID Number
Technology & Investment Solutions, LLC	81-1703675

D) Title of Project
Hy2green - Electrolytic Hydrogen Energy Storage Using Novel Metal Hydrides

E) Term and Amount

Start Date	End Date	Amount
5/1/2021	3/31/2025	$ 1,766,775

F) Business Meeting Information

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

Proposed Business Meeting Date 4/14/2021 ☐ Consent ☒ Discussion

Business Meeting Presenter Robin Goodhand Time Needed: 5 minutes

Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description:
Technology & Investment Solutions, LLC
Technology & Investment Solutions, LLC. Proposed resolution approving Agreement EPC-20-005 with Technology & Investment Solutions, LLC for a $1,766,775 grant to fund the field testing and performance validation of a pre-commercial hydrogen energy storage system to be installed at an existing anaerobic digestion facility, and adopting staff's determination that this action is exempt from CEQA. The project will validate the ability of metal hydrides to store hydrogen in a long-duration energy storage application. (EPIC funding) Contact: Robin Goodhand. (Staff presentation: 5 minutes)

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, § 15301 ; Cal. Code Regs., tit. 14, § 15303 ; Cal. Code Regs., tit. 14, § 15304

☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section: Cal. Code Regs., tit. 14, Section 15301 Existing Facilities provides that the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing structures, facilities, mechanical equipment or topographical features involving negligible or no expansion of use beyond that existing are categorically exempt from the provisions of CEQA. This project involves the field testing of a small scale (less than 10kW) skid mounted integrated Hy2green hydrogen energy storage system that includes electrolysis, metal hydride hydrogen storage at 40bar, fuel cell electrical regeneration, to be connected to an existing grid-connected solar photovoltaic system. The design work, component manufacturing and system assembly will mostly take place in the existing offices and manufacturing facilities of the Recipient and subcontractors. Therefore, this project is exempt under California Code of Regulations, title 14, section 15301, Existing Facilities.

Cal. Code Regs., tit. 14, sec. 15303 provides that projects which consist of construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure, are categorically exempt from the provisions of CEQA. This project involves installation and commissioning of a Hy2green hydrogen energy storage system that will be mounted on a movable skid. The skid will be placed on a concrete slab on previously disturbed ground adjacent to the Meadowbrook anaerobic digester and associated green park facility in El Mirage, California. The Hy2green hydrogen energy storage system will be connected to the site electrical and water services on the customer's side of the meter. Fire and explosion safety precautions will be taken regarding hydrogen storage and other project components. Therefore, the project falls within section 15303 and will not have a significant effect on the environment.

Cal. Code Regs., tit. 14, sect. 15304 provides that projects which consist of minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry and agricultural purposes are categorically exempt from the provisions of CEQA. The project will require minor alterations in the condition of land, water, and/or vegetation for trenching and backfilling for the installation of an electrical cable within conduit (approximate trench dimensions: 1000 feet in length, 1 foot in width and 3 feet in depth), as well as the installation of a concrete slab for supporting the skid mounted Hy2green hydrogen energy storage system (approximate dimensions: 40 feet in length, 12 feet in width and less than 1 foot in thickness). The trench and concrete slab will be installed on previously disturbed land with a gradient less than 10%, the trench will be backfilled, the surface restored, and the work will not involve the removal of any trees. Therefore, this project is exempt under California Code of Regulations, title 14, section 15304: Minor Alterations to Land.

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**
khalil kairouz consulting, LLC	$ 90,000
Electrical Work, Inc.	$ 90,000
Saga Automation LLC	$ 75,000
TBD - Electrical Engineer	$ 80,000
TBD Mechanical Contractor	$ 85,000
TBD Technician	$ 70,000
TBD Engineering	$ 30,000
TBD M&V Contractor	$ 20,000
Product Slingshot, Inc.	$ 490,000 (Equipment - Hy2Green system)
CIRCLE GREEN, INC.	$ Match $20,000 (Materials - site usage)

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

Legal Company Name:
Product Slingshot, Inc.
CIRCLE GREEN, INC.

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J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	19-20	301.001G	$1,766,775
			$
			$
			$
			$
			$

R&D Program Area: ESRO: ETSI TOTAL: $ 1,766,775

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Christian Tasser

Address: 2913 El Camino Real # 527

City, State, Zip: Tustin, CA 92782-8909

Phone: 714-702-4943

E-Mail: christian@technology-investment.org

2. Recipient's Project Manager

Name: Christian Tasser

Address: 2913 El Camino Real # 527

City, State, Zip: Tustin, CA 92782-8909

Phone: 714-702-4943

E-Mail: christian@technology-investment.org

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-19-305

☐ 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

Agreement Manager **Date**

Office Manager **Date**

Deputy Director **Date**

EXHIBIT A
Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Conceptual System Design
3	X	Final System Design
4	X	Procurement, Installation and Commissioning
5		Measurement and Verification
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities
8		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
M&V	Measurement and Verification
TAC	Technical Advisory Committee
Hy2green	A hydrogen energy storage product concept utilizing metal hydrides: the Hy2green system turns locally produced electricity from renewables into hydrogen and stores it very stably and safely long-term in metal powder. On demand, the hydrogen can quickly be released and converted back into electricity. https://www.hy2green.com/

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the field testing of a Hy2green hydrogen energy storage system; an electrolytic hydrogen energy system utilizing metal hydride energy storage. This project will field test a Hy2green hydrogen energy storage system. The field test data will be used to validate the performance of metal hydrides as a hydrogen storage medium, and to identify lessons learned to inform future deployments of metal hydride technology.

[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
California's energy storage market is dominated by lithium-ion based battery storage technologies; however, a diversified portfolio of energy storage technologies will be required to meet California's future energy goals.

Solution
Hydrogen energy systems provide a diverse set of energy solutions for meeting California's energy goals. For long duration energy storage applications, one challenge is the volume required for the storage of hydrogen gas. Conventional electrolytic hydrogen systems compress the hydrogen and store it at pressure in a tank. According to the recipient, the electrolytic generation of hydrogen and storage in metal hydrides allows storage at 17 liter per kg of hydrogen at a fraction of the pressure compared to gas storage (40 bar in metal hydride versus 700 bar in a gas tank). This project will test and validate the ability of metal hydrides to store hydrogen in a long duration energy storage application for comparison with projected costs and performance of an equivalent lithium ion energy storage solution.

C. Goals and Objectives of the Agreement

Agreement Goals
The goals of this Agreement are to:

- Field test at technology readiness level six the Hy2green hydrogen energy storage system comprising
  - Electrolyzer up to 9.6 kW
  - Metal Hydride storage for up to 67 kg of hydrogen; and
  - fuel cell up to 8 kW.
- Gather data to validate the performance of the Hy2green hydrogen energy storage system and ability of metal hydrides to store hydrogen in a long duration energy storage application
- Evaluate whole of life costs for the overall Hy2green hydrogen energy storage system and compare with projected costs for a lithium ion energy storage system with equivalent performance.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefit of greater electricity reliability by validating the ability of metal hydrides to store hydrogen in a long duration energy storage application, and gathering project lessons learned to inform future deployments of metal hydride energy storage, a technology with the potential to support California's energy goals.

Technological Advancement and Breakthroughs:[3] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of

[2] California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).
[3] California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

EXHIBIT A
Scope of Work

California's statutory energy goals set forth in SB 100 by validating the ability of metal hydrides to store hydrogen in a long duration energy storage application, and gathering project lessons learned to inform future deployments of metal hydride energy storage for providing alternative energy storage options, decoupling power from energy stored, reducing the costs and offering safe hydrogen storage for reliable power supplies.

Agreement Objectives

The objective of this Agreement is to field test and validate the performance of a pre-commercial Hy2green hydrogen energy storage system that will convert solar photovoltaic electricity into hydrogen and store it metal hydride powder, the hydrogen is converted back into electricity as and when needed. Key activities that will support these objectives shall include, but not be limited to:

- Integrate Hy2green hydrogen energy storage system controls and thermal management for
    - Alkaline Electrolyzer up to 9.6 kW
    - Metal hydride storage for up to 67 kg of hydrogen; and
    - fuel cell up to 8 kW.
- Integrate the Hy2green hydrogen energy storage system with solar photovoltaic power generation connected behind the utility meter at a customer site,
- Operate the Hy2green hydrogen energy storage system to validate performance,
- Evaluate Hy2green hydrogen energy storage system performance and costs for comparison with projected costs for an equivalent lithium ion energy storage system.

- **The language in Task 1 is standard for each agreement. Do not revise it.**

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 **two 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 shall include the expertise of each proposed TAC member and the value to the project. 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

*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. **Subtask 1.1 (Products)** describes the procedure for submitting products to the CAM.*

TASK 2: CONCEPTUAL SYSTEM DESIGN

The goal of this task is to undertake preliminary feasibility studies and develop a conceptual design for the Hy2green hydrogen system.

The Recipient shall:
- Prepare a *Conceptual System Design Report* outlining the planned system configuration and summarizing the design choices leading to the proposed configuration, as well as the conceptual site layout for installation of the Hy2green hydrogen system.
    - Evaluate customer site energy load profiles, energy needs, and site installation requirements.
    - Estimate energy performance and maximum production from the Hy2green hydrogen system.
    - Undertake preliminary design work as required to develop conceptual site layout.

Products:
- Conceptual System Design Report (Draft) (D201)
- Conceptual System Design Report (Final) (D202)

TASK 3: FINAL SYSTEM DESIGN

The goal of this task is to assess the efficiency and cost reduction potential associated with electrical integration and thermal management design choices, and then undertake detailed studies and design work as required to develop final designs for the Hy2green hydrogen system.

The Recipient shall:
- Prepare a *System Design Report* to document and describe the overall technical design of the Hy2green hydrogen system, its operating parameters and expected performance once it is fully deployed and commissioned.
    - Select component sizes and materials that are appropriate for the Hy2green hydrogen system;

    - Define electrolyzer, storage, fuel cell, solar panel sizes and materials of the Hy2green hydrogen system;
    - Undertake detailed design work and surveys as required to develop final designs and site layout;
        - Develop construction ready plans, drawings, documents and permits, including but not limited to; major component installation procedures, electrical engineering, inverters, controls and wiring, current transmitters, meters, hardware, integration with buildings and electrical interconnection to the utility.
- Prepare *CPR Report #1* per subtask 1.3
- Participate in CPR meeting per subtask 1.3

Products:

- System Design Report (Draft) (D301)
- System Design Report (Final) (D302)
- CPR Report #1 (Draft) (D303)
- CPR Report #1 (Final) (D304)

TASK 4: PROCUREMENT, INSTALLATION AND COMMISSIONING

The goal of this task is to procure, install and commission the components for the overall Hy2green hydrogen system.

The Recipient shall:

- Prepare a *Procurement, Installation and Commissioning Report* that includes but is not limited to the following:
    - Initial commissioning, technical performance, and challenges encountered during Hy2green hydrogen system procurement, delivery, installation and commissioning, planned approaches to optimize the system; as well as key lessons learned, best practice guidance and recommendations for streamlining future hydrogen project deployment.
    - A summary of the Hy2green hydrogen system commissioning processes, the commissioning tests and results, dates of achievement of key milestones such as: compliance with permits, written notice of practical completion, and utility permission to operate.
    - The report should summarize and document the as built Hy2green hydrogen system configuration, sub-system components, the installation process, and energy systems integration.
    - The report should include photographs documenting the site before, during and after installation.
- Prepare *CPR Report #2* per subtask 1.3
- Participate in CPR meeting per subtask 1.3

Products:

- Procurement, Installation and Commissioning Report (Draft) (D401)
- Procurement, Installation and Commissioning Report (Final) (D402)
- CPR Report #2 (Draft) (D403)
- CPR Report #2 (Final) (D404)

EXHIBIT A
Scope of Work

TASK 5: MEASUREMENT AND VERIFICATION
The goal of this task is to establish a detailed methodology for measurement and verification (M&V) of the Hy2green hydrogen system, to operate and optimize the system, and to evaluate the predicted versus actual performance and costs.

The Recipient shall:

- Prepare a *M&V Plan* that will detail the system parameters that will be measured to evaluate system performance, the baseline metrics and performance improvement goals, as well as the verification methodology that will be used to validate the results.
- Prepare a *M&V Report* that will detail the validated measured Hy2green hydrogen system performance, the baseline metrics and performance achieved, the data sources and analytical methodology used in the evaluations of system performance, energy use and greenhouse gas emissions. Costs and benefits will be evaluated from the perspective of customers and ratepayers. Operation, optimization, measurement and verification may include, but not be limited to, assessment of the following:
    - Hy2green hydrogen system performance: including, but not limited to, kWh per kg of hydrogen produced, storage pressure and volume requirements, system efficiency, and cost per kWh;
    - Inverters, integration with buildings; controls and hardware for Title 24 applications, utility interconnection, current transmitters, meters and hardware.
    - Optimization of the integration of the various components for the Hy2green hydrogen system, options for electrical integration and thermal management to achieve higher efficiencies and overall cost reductions.

Products:

- M&V Plan (Draft) (D501)
- M&V Plan (Final) (D502)
- M&V Report (Draft) (D503)
- M&V Report (Final) (D504)

TASK 6: 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:

    - <u>For Product Development Projects and Project Demonstrations:</u>
        - 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 (D601)
- Mid-term Benefits Questionnaire (D602)
- Final Meeting Benefits Questionnaire (D603)

EXHIBIT A
Scope of Work

TASK 7: 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) (D701 and D702)
- Final Project Fact Sheet (draft and final) (D703 and D704)
- Presentation Materials (draft and final) (D705 and D706)
- High Quality Digital Photographs (D707)
- Technology/Knowledge Transfer Plan (draft and final) (D708 and D709)
- Technology/Knowledge Transfer Report (draft and final) (D710 and D711)

TASK 8: PRODUCTION READINESS PLAN

The goal of this task is to determine the steps that will lead to the manufacturing of technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:
    - Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
    - Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."
    - The estimated cost of production.
    - The expected investment threshold needed to launch the commercial product.
    - An implementation plan to ramp up to full production.
    - The outcome of product development efforts, such as copyrights and license agreements.
    - Patent numbers and applications, along with dates and brief descriptions.
    - Other areas as determined by the CAM.

Products:

- Production Readiness Plan (Draft) (D801)
- Production Readiness Plan (Final) (D802)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 21-04-14-15

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: TECHNOLOGY & INVESTMENT SOLUTIONS, LLC

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

RESOLVED, that the CEC approves Agreement EPC-20-005 with Technology & Investment Solutions, LLC for a $1,766,775 grant to fund the field testing and performance validation of a pre-commercial hydrogen energy storage system to be installed at an existing anaerobic digestion facility. The project will validate the ability of metal hydrides to store hydrogen in a long-duration energy storage application; 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 April 14, 2021.

AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Patricia Carlos
Secretariat