**California Energy Commission**
**August 13, 2025 Business Meeting**
**Backup Materials for DarmokTech**

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Grant Request Form
3. Scope of Work

[PROPOSED]

**RESOLUTION NO: 25-0813-11b**

**STATE OF CALIFORNIA**

**STATE ENERGY RESOURCES**
**CONSERVATION AND DEVELOPMENT COMMISSION**

**RESOLUTION: DarmokTech**

**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-25-008 with DarmokTech for a $2,000,000 grant. This project in Livermore will integrate an innovative cell design with solid polymer electrolyte formulations to enhance performance, reduce costs, and improve safety of solid-state sodium batteries; 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 August 13, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kim Todd
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

# GRANT REQUEST FORM (GRF)

## A. New Agreement Number

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

**New Agreement Number**: EPC-25-008

## B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Bryan Lee
3. MS-:43
4. Phone Number: 916-776-0786

## C. Recipient's Information

1. Recipient's Legal Name: DarmokTech
2. Federal ID Number: 87-3598424

## D. Title of Project

Title of project: Next-Generation Solid State Sodium Polymer Batteries for Stationary Storage Applications with a Recyclable Design

## E. Term and Amount

1. Start Date: 9/1/2025
2. End Date: 8/30/2028
3. Amount: $2,000,000.00

## F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 8/13/2025 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Bryan Lee
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: N/A

**Agenda Item Subject and Description:**

**DarmokTech.** Proposed resolution approving agreement EPC-25-008 with DarmokTech for a $2,000,000 grant, and adopting staff's recommendation that this action is exempt from CEQA. The project in Livermore will integrate an innovative cell design with solid polymer electrolyte formulations to enhance performance, reduce costs, and improve safety of solid-state sodium batteries. (EPIC funding) Contact: Bryan Lee

## G. California Environmental Quality Act (CEQA) Compliance

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

   If yes, skip to question 2.

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

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

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

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

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

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

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

CCR section number: Cal. Code Regs., tit. 14, § 15306

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

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

The project includes the development, testing, and validation of advanced sodium solid-state polymer batteries (SSSPBs) for direct market penetration in grid storage applications. Sodium solid-state polymer batteries are energy storage devices that use a solid polymer electrolyte instead of the flammable liquid found in most traditional batteries, and sodium ions instead of lithium to carry the charge enabling the flow of electricity. Sodium-based batteries offer advantages in safety, cost, and energy density compared to lithium-based batteries. However, several technical and environmental challenges must be addressed before SSSPBs can become a practical replacement for current battery technologies. To hopefully solve these issues, this project introduces a new packaging design based on prismatic shape (somewhat like a 9-volt battery's shape) that allows battery components to be disassembled without damaging their structure—making material recovery and recycling easier and more environmentally friendly.

The development, testing, and validation will take place at DarmokTech's facility (expanded square footage in existing building) and at the existing Lawrence Livermore National Laboratory (LLNL), which are both in Livermore. LLNL will evaluate candidates for the electrolyte in the batteries and perform related research and testing. DarmokTech will apply its new battery cell packaging design based on prismatic shape, work on the disassembly and recycling methods, and perform related research and testing.

Both facilities already do research and work similar to the activities to be undertaken under the grant. ~~LLNL has prepared a Categorical Exemption under NEPA for its proposed activities.~~

Cal. Code Regs., tit. 14, Section 15306 provides that projects which consist of basic data collection, research, experimental management, and resource evaluation activities, and which do not result in a serious or major disturbance to an environmental resource are categorically exempt from the provisions of the California Environmental Quality Act. This project falls within these parameters.

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

b) Agreement **IS NOT** exempt.

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

No

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

| Additional Documents | Applies |
|---|---|
| Initial Study | No |
| Negative Declaration | No |
| Mitigated Negative Declaration | No |
| Environmental Impact Report | No |
| Statement of Overriding Considerations | No |
| None | Yes |

## H. Is this project considered “Infrastructure”?

No

## I. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter “No subcontractors to report” and “0” to funds. **Delete** any unused rows from the table.

| Subcontractor Legal Company Name | CEC Funds | Match Funds |
|---|---|---|
| DOE- Lawrence Livermore National Laboratory | $ 800,000 | **$**0 |

## J. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter “No vendors or sellers to report” and “0” to funds. **Delete** any unused rows from the table.

| Vendor/Seller Legal Company Name | CEC Funds | Match Funds |
|---|---|---|
| No vendors to report | **$** | **$** |

## K. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter “No key partners to report.” **Delete** any unused rows from the table.

| Key Partner Legal Company Name |
|---|
| No key partners to report |

## L. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter “N/A” for “Not Applicable” and “0” to Amount. **Delete** any unused rows from the table.

| Funding Source | Funding Year of Appropriation | Budget List Number | Amount |
|---|---|---|---|
| EPIC | 24-25 | 301.001L | $ 2,000,000 |

**TOTAL Amount:** $ 2,000,000

R&D Program Area: ESTB: ETSI

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: 101

## M. Recipient’s Contact Information

### 1. Recipient’s Administrator/Officer

Name: Deepak Upadhyaya

Address: 39 E Airway Blvd

City, State, Zip: Livermore, CA 94551

Phone: 925-989-8726

E-Mail: deepak@darmoktech.com

**2. Recipient's Project Manager**

Name: Deepak Upadhyaya

Address: 39 E Airway Blvd

City, State, Zip: Livermore, CA 94551

Phone: 925-989-8726

E-Mail: deepak@darmoktech.com

## N. Selection Process Used

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

| Selection Process | Additional Information |
|---|---|
| Competitive Solicitation # | GFO-23-317 |
| First Come First Served Solicitation # | Not applicable |
| Other | Not applicable |

## O. Attached Items

1. List all items that should be attached to this GRF by entering "Yes" or "No".

| Item Number | Item Name | Attached |
|---|---|---|
| 1 | Exhibit A, Scope of Work/Schedule | Yes |
| 2 | Exhibit B, Budget Detail | Yes |
| 3 | CEC 105, Questionnaire for Identifying Conflicts | Yes |
| 4 | Recipient Resolution | No |
| 5 | Awardee CEQA Documentation | Yes |

**Approved By**

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

**Agreement Manager:** Bryan Lee

**Approval Date:** 6/25/2025

**Branch Manager:** Reynaldo Gonzalez

**Approval Date:** 6/30/2025

**Director:** Reynaldo Gonzalez for Jonah Steinbuck

**Approval Date:** 6/30/2025

# EXHIBIT A
# Scope of Work
# DarmokTech

## I. TASK ACRONYM/TERM LISTS

### A. Task List

| Task # | CPR[1] | Task Name |
|---|---|---|
| 1 | | General Project Tasks |
| 2 | X | Identify SPE Candidates for Cell Testing |
| 3 | X | Optimize SPE Candidates and SSSPB Cells |
| 4 | | Tailor SPE Candidates and SSSPB Cell Disassembly |
| 5 | | Conduct Assessment of Market Viability and Environmental Sustainability |
| 6 | | Evaluation of Project Benefits |
| 7 | | Technology/Knowledge Transfer Activities |

### B. Acronym/Term List

| Acronym/Term | Meaning |
|---|---|
| CAM | Commission Agreement Manager |
| CAO | Commission Agreement Officer |
| CEC | California Energy Commission |
| CPR | Critical Project Review |
| $/kWh | Cost per kilowatt-hour |
| EIS | Electrochemical Impedance Spectroscopy |
| GHG | Greenhouse Gases |
| IES | Industrial Electronics Society |
| kWh | kilo-Watt hour (a measure of electrical energy which is used in battery technologies to measure the energy density of the battery) |
| LCOS | Levelized Cost of Storage |
| SES | Stationary Energy Storage |
| SPE | Solid Polymer Electrolyte |
| SPOC | Studying-Polymers-On a-Chip |
| SSSPBs | Solid-State Sodium Polymer Batteries |
| S/cm | Siemens per centimeter (unit for ion conductivity) |
| TAC | Technical Advisory Committee |
| TRL | Technology Readiness Level |
| Wh/kg | Watt-hours per kilogram (measure of energy density) |

[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.

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

### A. Purpose of Agreement

The purpose of this Agreement is to advance sodium solid-state polymer batteries (SSSPBs) for energy storage applications. Sodium solid-state polymer batteries[2] are energy storage devices that use a solid polymer electrolyte[3] instead of the flammable liquid found in most traditional batteries, and sodium ions instead of lithium to carry the charge enabling the flow of electricity. Sodium-based batteries offer advantages in safety, cost, and energy density compared to lithium-based batteries. However, several technical and environmental challenges must be addressed before SSSPBs can become a practical replacement for current battery technologies. To solve these issues, this project introduces a new packaging design based on prismatic shape[2] that allows battery components to be disassembled without damaging their structure—making material recovery easier and more environmentally friendly. This packaging design is integrated with advanced polymer electrolytes to improve safety, extend battery life, and support end-of-life material recovery (so that recovered material can be reused rather than wasted). The result is a sodium solid-state polymer battery that is more affordable, reliable, and sustainable—supporting California's clean energy and climate goals.

### B. Problem/ Solution Statement

**Problem**

The growing global energy demand and transition to clean energy highlights an urgent need for sustainable, scalable, and cost-effective grid storage solutions. Current lithium-ion batteries face critical limitations, including high costs, environmental impacts from lithium extraction, safety concerns, and material scarcity—factors that challenge their long-term viability for grid-scale applications.

Sodium-based batteries offer a promising alternative to lithium-based systems because sodium—found in compounds like common salt (sodium chloride)—is far more abundant and sustainable. However, sodium atoms are larger than lithium, which results in lower energy density[4]. For grid storage applications, where weight and compactness are less critical, SSSPBs present an attractive solution.

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[2] A battery is a device that stores chemical energy and converts it into electrical energy. It consists of five main components: (1) the anode (negative electrode), which releases electrons during discharge; (2) the cathode (positive electrode), which receives those electrons; (3) the electrolyte, which allows ions (electrically charged particles) to move between the anode and cathode to enable the flow of electricity; (4) the separator, a porous material that prevents short-circuiting by keeping the electrodes apart while still allowing ion flow; and (5) The enclosure case that holds all the components together. In this project, packaging design refers to the complete physical design that forms a functional battery cell by assembling components in a specific manner, along with system-level elements such as electrical connector. Batteries enclosure cases come in three common shapes: cylindrical (like AA batteries), pouch (with components enclosed in a soft, flexible casing), and prismatic (box-shaped, like 9V batteries)

[3] A polymer is a large molecule made up of many repeating units called monomers. Polymers can be natural, like proteins and DNA, or synthetic, like plastics. A polymer electrolyte is a solid or gel-like version that is safer but typically conducts ions less efficiently than the flammable liquid electrolytes used in most batteries today. In this project, we are using polymer electrolytes to improve battery safety and recyclability.

[4] Energy density refers to how much energy a battery can store relative to its weight (gravimetric energy density) or size (volumetric energy density). Because sodium atoms are about three times heavier than lithium atoms, sodium-based batteries typically have around 30% lower energy density than lithium-ion batteries. As a result, sodium battery designs need to be larger or denser to store the same amount of energy.

Additionally, because grid storage requires high levels of safety and stability, flammable liquid electrolytes must be replaced with nonflammable alternatives like polymer electrolytes. Another key challenge is finding a cost-effective and environmentally friendly way to recover materials at the end of a battery's life. Without such solutions, new batteries would rely on continuous mining and production—resulting in more waste, greater environmental impact, and slower adoption across the industry.

SSSPBs offer a promising solution to battery safety, as their solid polymer electrolytes are nonflammable and significantly reduce the risk of fire. Selecting high-performance, high-conductivity polymer electrolytes can enhance energy density and help reduce overall costs. However, key technical challenges remain in using polymer electrolytes—such as improving the interface[5] or connection between the electrodes and electrolyte to extend battery life and enable efficient ion transport across interface. Another key barrier is the environmental impact caused by traditional battery packaging design[6], which is hard to take apart and limits the ability to recycle or recover valuable materials.

Overcoming these issues is essential to unlocking the full potential of SSSPBs as a safe, cost-effective, and environmentally responsible solution for grid-scale energy storage.

## Solution

This project addresses key technical challenges described above that have limited the widespread adoption of SSSPBs including cost, safety, and recyclability. The project team has developed an innovative battery packaging design that enhances the interface or connection between the electrode and polymer electrolyte to improve performance, while also reducing environmental impact by enabling battery disassembly without the need for shredding[6] (common but inefficient method for recovering battery components at end-of-life). This design is expected to reduce long-term costs by approximately 30% through easier recovery and reuse of materials.

A fast, high-throughput[7] testing system will be used to identify polymer electrolytes that conduct ions efficiently while maintaining safety and stability. These materials are engineered to break

[5] The interface or connection between the electrode and the electrolyte is very important in SSSPBs because it's where ions must pass through to make the battery work. If this connection is poor, ions can't move easily, which reduces battery performance, safety, and lifespan. A good, stable interface or connection helps the battery work better, last longer, and charge more reliably

[6] In current battery packaging designs, components are tightly sealed, making separation difficult or impossible. As a result, batteries are shredded into small pieces at end of life for recycling. The shredded material is then processed using pyrometallurgy (high-temperature melting) or hydrometallurgy (chemical leaching) to extract valuable metals. These methods are energy-intensive, expensive, and often generate toxic waste—making recycling less efficient and less environmentally sustainable.

[7] High-throughput screening is the ability to rapidly, test a large number of samples in an automated way to identify formulations or mixes that have good performance properties of interest. In the case of polymer electrolytes, two key properties of interest are the ionic conductivity, which is the ability of the electrolyte to facilitate ion movement between electrodes, and the mechanical properties, which are important for the lifetime and stability of the battery as well as creating a good electrode-electrolyte interface. Traditionally it takes at least three months to evaluate 10-20 electrolyte formulations, whereas our system is able to screen up to 80 in a single day, accelerating development and productization.

down in a controlled manner (controlled degradation)[8] at the end of the battery's life, allowing for the recovery of sodium and other components—supporting recyclability.

By combining packaging design with advanced polymer electrolytes, the SSSPB is positioned to deliver a lower Levelized Cost of Storage (LCOS) while meeting California's growing demand for clean, reliable energy storage. Here LCOS represents the average cost to store and deliver one unit of electricity over a battery's lifetime, usually measured in dollars per kilowatt-hour ($/kWh).

### C. Goals and Objectives of the Agreement

**Agreement Goals**
The goals of this Agreement are to:

- Integrate and validate an advanced recyclable prismatic packaging design using a polymer electrolyte to improve performance and extend the operational life of SSSPBs.
- Mitigate safety risks associated with flammable liquid electrolytes used in traditional lithium-ion and sodium-ion batteries, enhancing the safety profile of energy storage systems.
- Achieve reductions in the LCOS compared to liquid electrolyte-based batteries.
- Optimize packaging design for disassembly and material recovery processes to improve recyclability.

Ratepayer Benefits[9]
This Agreement is intended to result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by providing an advanced SSSPB product that can replace current lithium-based energy storage battery chemistries. Sodium is far more abundant than lithium, making it a more sustainable choice. A SSSPBs with performance comparable to lithium-ion technology could become a market leader due to its cost and resource advantages.

In addition, the recipient's innovative cell packaging design allows for efficient disassembly, enabling easier recovery and reuse of battery components—further lowering lifecycle costs. Sodium is also more stable than lithium and does not form dendrites, which are tiny metal spikes that can cause short circuits. This reduces the risk of thermal runaway, a dangerous chain reaction often seen in liquid electrolyte lithium batteries where heat builds up uncontrollably, potentially causing fire or explosion. This typically occurs when a battery overheats, is damaged, short-circuits, or is overcharged. By using a nonflammable solid polymer electrolyte, the SSSPB provides enhanced safety and reliability for grid storage applications

Technological Advancement and Breakthroughs:[10] This grant is intended to result in technological advancement and breakthroughs to overcome barriers to achieve the State of

[8] Controlled or controllable degradation means that we can break down and degrade the polymer electrolyte in a defined and systematic way, so that it does not break down during battery use and breakdown only when required during recycling. Proposed methods to control degradation include applying heat, acid, or base solutions to the battery after disassembly to cause the polymer to degrade
[9] 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).
[10] 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.

California's statutory energy goals. This project uses an advanced testing system called Studying-Polymers-On a-Chip (SPOC) that can quickly measure how well different battery materials work and automatically save the results in a growing database. Then, machine learning—a type of computer technology that finds patterns and learns from data—is used to predict which materials might work better. The system help discover new polymer electrolyte materials faster by learning which combinations perform best and suggesting new ones to try. As more data is collected, the system keeps improving its predictions. By using high-throughput screening and characterization systems, along with a dynamic database and machine learning feedback, this grant aims to accelerate the optimization of solid polymer electrolytes and advance SSSPBs to meet growing market demand.

By combining the polymer electrolyte developed through this approach with the recipient's unique packaging design—which improves control at the electrode-electrolyte interface—the battery's stability and lifespan are expected to improve, targeting over 5,000 charge-discharge cycles. These innovations aim to reduce the cost of energy storage to approximately $0.17 per kilowatt-hour (kWh) by using lower-cost materials like sodium, increasing energy density to 250 watt-hours per kilogram (Wh/kg), and extending battery life and safety with a solid-state design. The battery is also designed for recyclability and reuse. With larger-scale production and lower manufacturing costs, future cost reductions are expected, with a long-term target of $0.05/kWh.

**Agreement Objectives**

The objectives of this Agreement are to:

- **Fabricate and validate SSSPBs:** Integrate a recyclable prismatic cell design with an optimized polymer electrolyte to achieve energy densities of 250-275 Wh/kg and advance the combined technology readiness level (TRL) from TRL 3 to TRL 6.
- **Improve Interface Stability**: Address and resolve challenges at the electrode-polymer electrolyte interface to improve cycle life and achieve >3000 cycles.
- **Develop Polymer Electrolyte:** Screen over two hundred formulations of solid polymer electrolytes to achieve relatively high ionic conductivities ($\geq 10^{-5}$ S/cm at room temperature) while maintaining controllably degradable properties for full recyclability and reuse of battery materials.
- **Reduce Cost**: Perform LCOS analysis to demonstrate SSSPBs cost-competitiveness with traditional lithium-ion and sodium-ion batteries by lowering pre-commercialization LCOS (target of $0.14/kWh).
- **Enhance Safety**: Eliminate risks associated with flammable liquid electrolytes, ensuring safer SES by passing safety test as described in Industrial Electronics Society (IES) safety standard.

## 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, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in 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., Teams, Zoom), with approval of the CAM.

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5)
  - Quarterly Progress reports (subtask 1.6)
  - Final Report (subtask 1.7)
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards(subtask 1.10);
  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; 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 may 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 may 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. A determination of unsatisfactory progress This may result in project delays, including a potential Stop Work Order, while the CEC determines whether the project should continue.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

**Recipient Products:**
- CPR Report(s)

**CAM Products:**
- CPR Agenda(s)
- Progress Determination

**Subtask 1.4 Final Meeting**
The goal of this subtask is to complete the closeout of this Agreement.

**The Recipient shall:**
- Meet with CEC staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

  The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.
  - The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
  - The administrative portion of the meeting will involve a discussion with the CAM 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* organized by the tasks in the Agreement.

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

***MONTHLY CALLS, REPORTS AND INVOICES***

**Subtask 1.5 Monthly Calls**
The goal of this task is to have calls at least monthly between the CAM and Recipient to verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.

The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are

consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted, or the CAM determines that a monthly call is unnecessary.

**The CAM shall:**

- Schedule monthly calls.
- Provide questions to the Recipient prior to the monthly call.
- Provide call summary notes to Recipient of items discussed during call.

**The Recipient shall:**

- Review the questions provided by CAM prior to the monthly call
- Provide verbal answers to the CAM during the call.

**Product:**

- Email to CAM concurring with call summary notes.

**Subtask 1.6 Quarterly 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 *Quarterly 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 reporting period, 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. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: https://www.energy.ca.gov/media/4691
- Submit a monthly or quarterly *Invoice* on the invoice template(s) provided by the CAM.

**Recipient Products:**

- Quarterly Progress Reports
- Invoices

**CAM Product:**

- Invoice template

**Subtask 1.7 Final Report**

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

**Subtask 1.7.1 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 Products:**

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

**Subtask 1.7.2 Final Report**

**The Recipient shall:**

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised Final Report electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

**Products**:

- Summary of TAC Comments on Draft Final Report
- Draft Final Report
- Written Responses to Comments *(if applicable)*
- Final Report

**CAM Product:**

- Written Comments on the Draft Final Report

## *MATCH FUNDS, PERMITS, AND SUBAWARDS*

### Subtask 1.8 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. 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 application 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 application 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 1.9 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 1.10 Obtain and Execute Subawards and Agreements with Site Hosts**

The goals of this subtask are to: (1) procure and execute subrecipients and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subrecipients and site host agreements are consistent with the Agreement terms and conditions and the Recipient's own contracting policies and procedures.

**The Recipient shall:**

- Execute and manage subawards and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Execute and manage site host agreements, and ensure the right to use the project site throughout the term of the Agreement, as applicable. A site host agreement is not required if the Recipient is the site host.
- Notify the CEC in writing immediately, but no later than five calendar days, if there is a reasonable likelihood the project site cannot be acquired or can no longer be used for the project.
- Incorporate this Agreement by reference into each subaward.
- Include any required Energy Commission flow-down provisions in each subaward, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subaward terms.
- Submit a *Subaward and Site Letter* to the CAM describing the subawards and any site host agreement needed or stating that no subawards or site host agreements are required.
- If requested by the CAM, submit a draft of each *Subaward* and any *Site Host Agreement* required to conduct the work under this Agreement.

- If requested by the CAM, submit a final copy of each executed *Subaward* and any *Site Host Agreement*.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the terms regarding subrecipient additions in the terms and conditions).

**Products:**

- Subaward and Site Letter
- Draft Subawards *(if requested by the CAM)*
- Draft Site Host Agreement *(if requested by the CAM)*
- Final Subawards *(if requested by the CAM)*
- Final Site Host Agreement *(if requested by the CAM)*

## *TECHNICAL ADVISORY COMMITTEE*

**Subtask 1.11 Technical Advisory Committee (TAC)**

The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the Agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that ensure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

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

- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

**The Recipient shall:**

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.12.
- 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 1.12 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* for each TAC Meeting 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 ensure 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 1.13 Project Performance Metrics**
The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

**The Recipient shall:**
- Complete and submit the project performance metrics section of the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
    - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
    - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

**Products:**
- TAC Performance Metrics Summary
- Project Performance Metrics Results

## IV. TECHNICAL TASKS

### TASK 2 IDENTIFY SPE CANDIDATES FOR CELL TESTING WITH APPROPRIATE IONIC CONDUCTIVITIES

The goals of this task are to: 1) Develop polymer electrolytes that remain stable during battery use but are designed to break down in a controlled and systematic way (controlled degradation) during recycling with performance properties needed for robust sustainable SSSPB, and 2) demonstrate recyclable packaging design for battery assembly and disassembly.

**The Recipient shall:**
- Build recyclable cell capability by:
    - Fabricating all cell casing, housing, and tab components
    - Assessing cell design and disassembly using existing lithium and sodium electrode baseline configurations

- Screen thermoset Solid Polymer Electrolyte (SPE) formulations with controllably degradable bonds to:
    - Identify and winnow down the candidate chemistry candidates for controlled degradation
    - Establish baseline ionic conductivity and stability levels
- Increase ionic conductivity using Studying-Polymers-On a-Chip (SPOC) screening by:
    - Screening over 200 different formulation compositions with varying polymer chemistry parameters such as crosslink-density, passive filler composite additives, and monomer formulation composition
- Optimize ionic conductivity to winnow down the candidate SPEs for testing in cells
- Conduct cyclic testing of candidate SPEs and degradation characterization to demonstrate:
    - Preliminary lifetime and cyclic stability testing
    - Dynamic breakdown of SPEs only under controlled breakdown conditions
- Create a draft *SPE Screening Plan* that includes but is not limited to an outline of:
    - The tests being conducted including electrochemical impedance spectroscopy (EIS), battery cycling studies, voltage stability window sweeps, and mechanical testing. These testing methods are standard battery tests that are essential to assess performance of the SPE for future battery use.
    - Critical metrics being validated including but not limited to ionic conductivity, mechanical strength, and electrode compatibility.
    - Measurement tools for verification
    - Desired qualifications and improvements moving forward
- Adjust and create a final *SPE Screening Plan* after meeting with CAM for feedback and incorporating changes as requested.
- Prepare a draft *SPE Screening Project Update Report* which includes but is not limited to:
    - Process and results of the ongoing tests
    - Testing of the preliminary test cell integrating SPEs with Recipient battery cells and performing cell electrical testing.
    - Technical issues and risk mitigation strategies
    - Lessons learned for this phase in the project
- Submit the draft *SPE Screening Project Update Report* to the CAM for feedback and incorporate changes as requested in the final *Project Update Report*.
- Prepare a *CPR Report* #1 in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

**Products:**

- SPE Screening Plan (draft and final)
- SPE Screening Project Update Report (draft and final)
- CPR Report #1 (draft and final)

**TASK 3 OPTIMIZE SPE CANDIDATES AND SSSPB CELLS**

The goals of this task are to integrate and optimize the SSSPB chemistry within the unique cell design, and measure and validate improved performance and lifespan through cyclic testing.

**The Recipient shall:**

- Fabricate cells and conduct battery cycling to demonstrate:
    - The potential for facile industrial fabrication using photocurable SPE formulations
    - The complete process of coating, curing, assembly, testing, and non-shredding disassembly
- Improve SPEs through continued SPOC screening and iteration with cell testing to:

    - Expand the testing database, data sharing, and collaboration across the project team.
- Train machine learning models on the updating database to:
    - Accelerate improvement of SSSPBs
    - Predict future formulations with improved performance for further testing
- Create a draft *SPE Optimization Plan* that includes but is not limited to an outline of:
    - The tests being conducted will include EIS, battery cycling studies, and voltage stability window sweeps, and mechanical testing.
    - Critical metrics being validated including but are not limited to ionic conductivity, mechanical properties, and electrode compatibilities.
    - Measurement tools for verification
    - Desired qualifications and improvements moving forward
- Adjust and create a final *SPE Optimization Plan* after meeting with CAM for feedback and incorporating changes as requested.
- Prepare a draft *SPE Optimization Project Update Report* which includes but not limited to:
    - Process and results of the ongoing tests
    - Testing of the second-generation test cells
    - Technical issues and risk mitigation strategies
    - Lessons learned for this phase in the project
- Submit the draft *SPE Optimization Project Update Report* to the CAM for feedback and incorporate changes as requested in the final *SPE Optimization Project Update Report*.
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

**Products:**

- SPE Optimization Plan (draft and final)
- SPE Optimization Project Update Report (draft and final)
- CPR Report #2 (draft and final)

**TASK 4 TAILOR SPE CANDIDATES AND SSSPB CELL DISASSEMBLY**

The goal of this task is to utilize the database of testing from Tasks 2 and 3 to tailor materials and design to show effective non-shredding disassembly and materials recovery processes for anode and cathode materials.

**The Recipient shall:**

- Test cells with polymer electrolytes formulations identified through the machine learning models to demonstrate:
    - The ability to use active learning to accelerate optimization of SSSPBs
    - Improvement of SPE performance metrics for cells
- Recover sodium from polymer electrolyte of tested cells to demonstrate:
    - The ability to control breakdown and enable non-shredding disassembly and recyclability of Recipient cells
    - Preliminary envisioned protocols for industrial use of cells with SPE materials
- Test cells made with recycled components to demonstrate:
    - The ability to recover sodium and electrode material without shredding
    - The ability to regenerate and reuse SSSPBs using the combined SSSPB system
- Create a draft *Tailoring Plan* that includes but is not limited to an outline of:
    - The tests being conducted including EIS, battery cycling studies, and voltage stability window sweeps, and mechanical testing.
    - Critical metrics being validated including but are not limited to ionic conductivity, mechanical properties, and electrode compatibilities.

    - Measurement tools for verification
    - Desired certifications
- Adjust and create a final *Tailoring Plan* after meeting with CAM for feedback and incorporating changes as requested.
- Prepare a draft *Verification Report* which includes but not limited to:
    -
    - Process and results of the final demonstration
    - Testing of the product
    - Technical issues
    - Lessons learned for this phase in the project
- Submit the draft *Verification Report* to the CAM for feedback and incorporate changes as requested in the final *Verification Report*.

**Products:**

- Tailoring Plan (draft and final)
- Verification Report (draft and final)

**TASK 5 CONDUCT ASSESSMENT OF MARKET VIABILITY AND ENVIRONMENTAL SUSTAINABILITY**

The goal of this task is to assess throughout the project the cost, sustainability, industrial viability, and impact of the ongoing SSSPB formulations and material on market potential and environmental impact.

**The Recipient shall:**

- Validate safety through a standard safety test, including but not limited to nail puncture testing, to ensure nonflammability of SPE
- Conduct LCOS and GHG emission analysis
- Perform cost-benefit-risk analysis for scalability
- Prepare draft *Market and Environmental Impact Report* of the resulting information including but not limited to:
    - Results from the safety test
    - Cost breakdowns
    - Prospective cost improvements
    - Summaries of cost-benefit risk analysis and mitigation strategies
    - Updated TRL and technology risk assessment for commercial implementation
- Submit the draft *Market and Environmental Impact Report* to the CAM for feedback and incorporate changes as requested in the final *Market and Environmental Impact Report.* This report will be submitted in tandem with the *Verification Report* of Task 4.

**Products:**

- Market and Environmental Impact Report (draft and final)

**TASK 6: EVALUATION OF PROJECT BENEFITS**

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

**The Recipient shall:**

- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with ‘Kick-off’ selected for the ‘Relevant data collection period’ and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes but is not limited to the following information:

    - Technology commercialization progress
    - New media and publications
    - Company growth
    - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

**Products:**

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

**TASK 7 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

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

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

**The Recipient Shall:**

- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the draft *Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Technology Transfer Plan. This document will identify:
    - TAC comments the Recipient proposes to incorporate into the final *Technology Transfer Plan*.
    - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the final *Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in final *Technology Transfer Plan*.

- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of cell assemblies and facilities.

**Products:**

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

## V. Project Schedule

Please see the attached Excel Spreadsheet.