California Energy Commission
June 12, 2024 Business Meeting
Backup Materials for Noon Energy Inc.

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

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

[PROPOSED]

RESOLUTION NO: 24-0612-09c

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Noon Energy Inc.

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

RESOLVED, that the CEC approves agreement EPC-23-036 with Noon Energy Inc. for a $8,760,557 grant. The project will demonstrate a reversible carbon dioxide to carbon conversion-based storage system to provide 100 kilowatts / 10 megawatt-hours of LDES combined with an existing solar PV field to provide up to 100 hours of capacity for regional disadvantaged and low-income communities, and energy offsets to critical facilities in Yolo County. Staff recommends conditional approval of this item based upon funding availability as of the 2024 Budget Act; 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 June 12, 2024.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
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-23-036

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Sean Anayah
3. MS-: 51
4. Phone Number: (916) 931-5044

C. Recipient's Information

1. Recipient's Legal Name: Noon Energy Inc.
2. Federal ID Number: 19-4254175

D. Title of Project

Title of project: Scale-up of Ultra Low Cost Long-Duration Battery for Fully Reliable Renewable Power

E. Term and Amount

1. Start Date: 7/1/2024
2. End Date: 6/30/2028
3. Amount: $8,760,557.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 6/12/2024 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Zoe Higgerson
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

Noon Energy Inc. Proposed resolution conditionally approving agreement EPC-23-036 with Noon Energy Inc. for a $8,760,557 grant and adopting staff's determination that this action is exempt from CEQA. The project will demonstrate a reversible carbon dioxide to carbon conversion-based storage system to provide 100 kilowatts / 10 megawatt-hours of LDES combined with an existing solar PV field to provide up to 100 hours of capacity for regional disadvantaged and low-income communities, and energy offsets to critical facilities in Yolo County. Staff recommends conditional approval of this item based upon funding availability as of the 2024 Budget Act. (EPIC funding) Contact: Zoe Higgerson

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

California Code of Regulations, title 14, section 15301 provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible or no expansion of use beyond that existing at the time of the lead agency's determination, are categorically exempt from the provisions of the California Environmental Quality Act. All of the components for this project will be installed on a gravel pad at an existing Photovoltaics for Utility Scale Applications (PVUSA) site in Yolo County in an area that is currently used for equipment storage and has been historically used for prior on-site demonstrations. The proposed battery system would connect to an existing electrical connection located immediately north of the proposed gravel pad area. Existing internal access roads would be sufficient to support the proposed use. These modifications will not result in any expansion of capacity. For these reasons, the proposed work will not have any significant effect on the environment and falls under section 15301.

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 CEQA. This project includes the placement of gravel to create a pad for a single, 40-foot long shipping container (approximately 400 square feet) mounted on a semi-truck trailer chassis for a temporary basis. The container and all ancillary equipment would remain onsite for approximately 18 months and would then be removed from the property. The container will house the proposed 100 kW / 10 MWh battery energy storage system. The area on which the container will be placed is currently used for equipment storage and has been historically used for prior on-site demonstrations. For these reasons, the project falls within section 15303 and will not have a significant impact on the environment.

Cal. Code Regs., tit. 14, sec. 15306 provides that projects that consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource are exempt categorically exempt from CEQA. These may be strictly for information gathering purposes, or as part of a study lending to an action which a public agency has not yet approved, adopted, or funded. The proposed project is part of a research project to demonstrate, validate, and accelerate the commercialization of a novel, safe, and reversible solid oxide battery energy storage system. The proposed project is located at the existing PVUSA site, a research/demonstration facility that houses similar solar arrays and related infrastructure.

This project does not involve impacts on any particularly sensitive environment; 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.

For these reasons, the proposed work will not have any significant effect on the environment and falls under sections 15301, 15303, and 15306.

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
Electric Power Research Institute, Inc.	$300,000	$300,000
Apillis	$562,500	$562,500
Alten Technology USA Inc.	$885,159	$885,165

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
TBD - Engineering	$75,000	$75,000

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	22-23	301.001J	$ 8,760,557

TOTAL Amount: $ 8,760,557

R&D Program Area: ESTB: ETSI

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Banu Alkaya Aksoy

Address: 470 Ramona St

City, State, Zip: Palo Alto, CA 94301-1707

Phone: 650-862-7944

E-Mail: banu@noon.energy

3. Recipient’s Project Manager

Name: Christopher Graves

Address: 470 Ramona St

City, State, Zip: Palo Alto, CA 94301-1707

Phone: 650-815-6485

E-Mail: chris@noon.energy

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-22-307
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

Item Number	Item Name	Attached
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: Sean Anayah

Approval Date: 5/2/2024

Branch Manager: Reynaldo Gonzalez

Approval Date: 5/2/2024

Director: Reynaldo Gonzalez for Cammy Peterson

Approval Date: 5/2/2024

EXHIBIT A
Scope of Work
Noon Energy Inc.

I. ASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR [1]	Task Name
1		General Project Tasks
2		Engineering and Design
3	X	Procurement, Fabrication/Construction, and Commissioning
4		Operation Validation and Reporting
5	X	Community Benefits
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
BESS	Battery Energy Storage Systems
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CAPEX	Capital Expenditure
CEC	California Energy Commission
CO2	Carbon Dioxide
CPR	Critical Project Review
EPIC	Electric Program Investment Charge
EPRI	Electric Power Research Institute
IOU	Investor-Owned Utilities
kW / kWh	kilowatt / kilowatt-hour
LCOS	Levelized Cost of Storage
LDES	Long Duration Energy Storage
MW / MWh	Megawatt / Megawatt-hour
MOXIE	Mars Oxygen In-Situ Resource Utilization Experiment
M&V	Measurement and Verification
PG&E	Pacific Gas and Electric
PSPS	Public Safety Power Shutoffs
RTE	Round Trip Efficiency
SQL	Structured Query Language
TAC	Technical Advisory Committee

[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.

Acronym/Term	Meaning
XML	Extensible Markup Language

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the advancement and demonstration of a novel, 100 kW / 10 MWh reversible solid oxide battery system, capable of providing up to 100 hours of low-cost, long duration energy storage (LDES) to support renewable energy storage, load balancing, and grid services while directly benefiting underserved communities and reducing demand for diesel fueled generators. The project will also support future commercialization of this modular, highly replicable technology, ultimately supporting $0.05/kWh Levelized Cost of Storage (LCOS).

B. Problem/ Solution Statement

Problem

Today's existing, commercial battery technologies suffer from: high per kWh costs which limits their use for long duration storage, frequent cycling leading to capacity degradation and limited depth of discharge, heat- and fire- related safety risks that increase as batteries age, and reliance on scarce metals and other difficult to source materials. To date, these concerns have hindered the use or limited the applicability of existing battery storage technologies for most LDES applications, including long duration backup supply, grid scale services for periods longer than a few hours, facilitating higher renewable penetration by balancing supply and demand from these intermittent sources, and other grid and distributed scale storage needs.

Concurrently, demand for long duration grid level and distributed / site level reliability have continued to rise. Driven by increasing incidence of extreme weather events, public safety power shutoffs (PSPS), and in many cases aging grid facilities, Investor-Owned Utilities (IOU) ratepayers face a higher frequency of grid-down events. Such outages are a critical concern for ratepayers, utilities, and the state, as California is working to transition away from fossil fuel use and increasingly rely on renewable electricity to meet statewide energy demand. Moreover, the decreasing cost of intermittent renewable energy is driving demand for improved, long duration power balancing and storage solutions, to ensure that renewable energy can be used to meet end user demand at the time of use.

Solution

The Recipient has developed a novel reversible solid oxide battery technology that provides long duration, low-cost energy storage that minimizes capacity degradation, avoids major safety concerns associated with current lithium-ion (Li-ion) batteries, and relies on abundant materials for fabrication, while minimizing the use of lithium, scarce

metals, and other costly and limited supply materials. The proposed system will house 100 kW / 10 MWh of electricity storage in a 40-foot shipping container—less than half the size and weight of a similar capacity Li-ion based storage system. The Recipient will demonstrate system operation on site at a solar energy facility, thereby validating its use for renewable energy backup, while improving the resiliency and reliability of renewable energy supplies to nearby communities. Moreover, the proposed solution will also demonstrate low cost, long duration energy storage, and demonstrate community benefits that could be realized en masse during future commercialization.

The system will fully validate the Recipient's technology at the commercial scale. The system operates using an advanced energy storage process. Briefly, during the charging phase, incoming electricity is used to convert low-cost, non-metal oxide chemicals into storage chemicals via electrolysis into oxygen and the storage chemical. The oxygen is vented to the atmosphere, while the resulting storage chemical is stored in a holding tank in the system. During discharge, the process is reversed, and the product (the original non-metal oxide chemical) is returned to the discharge tank. The proposed 100 kW / 10 MWh system represents the Recipient's ultimate modular system target for commercialization. Herein, a single system could be deployed to provide up to 100 hours of distributed-scale resiliency, while a multi-module system could be applied to larger industrial loads or to support grid-scale / utility-scale LDES. Upon future commercialization, the low cost of base materials, modular design, limited capacity degradation, ability to support deep discharge, and long lifetimes of up to 20 years will enable a LCOS of less than $0.05/kWh.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Advance and demonstrate an advanced, modular reversible solid oxide battery storage system capable of providing 100 kW / 100 hours of LDES with limited capacity degradation and potential for low-cost operation (LCOS less than $0.05/kWh) during future commercialization.
- Demonstrate up to 100 hours of LDES used to support storage and balancing of intermittent renewable power.
- Demonstrate a pathway toward significant benefits for communities, including low cost, long duration energy storage to support resiliency, improved renewable power utilization, and reduced cost electricity.
- Demonstrate a system level round trip efficiency of at least 50%, with a pathway to improved efficiency during subsequent commercialization.
- Demonstrate an energy density that is among the highest possible among LDES technologies, capable of outperforming conventional Li-ion technologies by two to three times.
- Demonstrate real world, direct benefits to underserved communities and to critical facilities that provide services to underserved communities.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety as follows:

Greater Electricity Reliability: California IOU ratepayers will directly benefit from a 100+ hour "ultra long duration energy storage" system being demonstrated. The first direct benefit is in reducing curtailed energy as 100% renewable energy mandates are put in place. This will save billions of dollars in Capital Expenditure (CAPEX) from the overbuilding of solar and wind energy to be able to meet the demand of ratepayers 24 hours per day, 7 days per week, 365 days per year. The Recipient is able to shift enough energy in a cost-effective way seasonally that direct benefits to ratepayers will also occur through the shifting of excess summer solar energy into solar-deficient winter months and provide full reliability.

Lower Costs: Energy cost reductions afforded by the project will result from two key categories of cost reduction: reduced capital and operational costs for storage system deployment and use, and improved ability to store low-cost solar energy, to offset higher cost energy from peaking power and other sources of high-cost electricity. With respect to reduced storage cost, the Recipient's system, when fully commercialized, will enable 100+ hour energy storage for a LCOS of less than $0.05/kWh – enabled by a capital cost below $20 per kWh storage capacity. In contrast, a typical Li-ion battery system is unable to cost-effectively provide this type of long-duration energy storage; today the cost is more than 10x higher and is expected to remain more than 5x higher even with major Li-ion cost reductions.

***Increased Safety*.** In contrast to conventional Li-ion batteries, Recipient's battery system avoids thermal runaway and related fire hazards and resulting toxic emissions/spills. In the unlikely event of a failure of the Recipient's system, based on tests and modeling completed to date, the system simply shuts down and becomes incapable of storing or releasing electricity until repaired. Therefore, when fully commercialized, it is anticipated that the Recipient's technology would minimize fire and toxic vapor hazards compared with Li-ion technology, which has resulted in approximately 9.3 major hazardous failures per year since 2019. Assuming a 500x or greater increase in Li-ion Battery Energy Storage Systems (BESS) over the next 20 years based on potential Li-ion technology commercialization and grid / distributed scale deployment, converting the Recipient's technology could alleviate as many as 2,000 to 5,000 hazardous failures per year, over a system's 20-year lifetime.

[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).

Technological Advancement and Breakthroughs:[3] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by demonstrating a novel reversible solid oxide electrolysis-based energy storage technology. The Recipient was part of the team that deployed the core components of this technology for a NASA project on its rover that has been operating since 2021 as part of the Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE)system. This breakthrough of being able to split non-metal oxide chemicals into storage chemicals on earth, the same way that the electrolysis system is doing with CO2 on Mars, and then store the resulting storage chemicals will demonstrate the almost unlimited ability to store energy for long durations without the mining of critical elements at a significant cost to the environment.

Moreover, the system will achieve significant benefits over the current technologies, based on a reference case of current, commercially available Li-ion technology. Herein, the proposed system will achieve the following benefits versus Li-ion based battery storage: 1) Reduce capital costs by 90%+ (e.g., 10x lower cost) versus Li-ion at 100+ hour storage capacity, upon future commercialization and mass-production; 2) Pose no risk of thermal runaway, dendrite formation, lithium fire, or other critical safety risks; 3) Eliminate reliance on foreign supplied base materials and components; 4) Fully domestic supply chain is possible; 5) Two to three times smaller weight and footprint; and 6) 90% fewer critical elements used than Li-ion (comparing kg of element per kWh storage capacity).

Agreement Objectives

The objectives of this Agreement are to:

- Complete final design of the proposed reversible solid oxide cell based LDES battery, sufficient to provide 100 kW and 10 MWh of storage capacity.
- Integrate all applicable safety requirements into the proposed design, sufficient to meet federal, state, and local requirements.
- Procure and fabricate all system components needed for project execution.
- Assemble a single LDES battery unit into the volume footprint of a 40-ft shipping container.
- Integrate the assembled LDES battery unit at the targeted demonstration site, including connection to the existing on-site solar energy system, and grid connection.
- Complete system commissioning and pre-operational testing to validate operability.
- Demonstrate the completed, operational system for a total of at least 12 months, including 15-minute data collection over the demonstration period.
- Validate effective storage of renewable solar electricity and subsequent dispatch onto PG&E's power grid

[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.

- Validate system operation including 100 kW maximum power output / 35 kW nominal power output, with at least 100 hours of storage duration (10 MWh capacity), system level round trip efficiency of >50%, and operability within targeted safety parameters for faults, system temperature, and system pressure.
- Track key community benefits including offset of energy costs supporting the use of 100% renewable electricity, and benefits to IOU ratepayers including stored renewable energy (kWh), electricity cost reductions, and improved resiliency (kWh stored for resiliency purposes)
- Validate a viable pathway to achieve $0.05/kWh LCOS for the proposed system, upon full commercialization, based on a 100-kW modular system demonstrated under the project.
- Demonstrate energy density that is more than double that of Li-ion battery technology, sufficient to store 100 hours of energy in half of the physical volume of Li-ion technology.
- Demonstrate a community benefit use case of estimated energy cost savings to a community serving organization and a critical facility.
- Provide direct community benefits including scholarships, learning / educational opportunities, hiring that targets underserved communities, and instructional materials to support future workforce training efforts.

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 CEC'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.

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

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up)

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

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Administrative products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Match fund documentation (subtask 1.7);
  - Permit documentation (subtask 1.8);
  - Subcontracts (subtask 1.9); and
  - Any other relevant topics.

  The technical portion of the meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Technical products (subtask 1.1);
  - Progress reports (subtask 1.5);
  - Final Report (subtask 1.6);

- Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
- Any other relevant topics.

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

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

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

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

CAM Product:
- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings
The goal of this subtask is to determine if the project should continue to receive CEC funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the CEC and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient and may include the CAO and any other individuals selected by the CAM to provide support to the CEC.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the CEC, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

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

The CAM shall:

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

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda(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 and the CAO of the following Agreement closeout items:
    - Disposition of any procured equipment.
    - The CEC's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:
- Submit a monthly *Progress Report* to the CAM. Each progress report must:
  - Summarize progress made on all Agreement activities as specified in the scope of work for the preceding month, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions, including a financial report on Match Funds and in-state expenditures.

Products:
- Progress Reports
- Invoices

Subtask 1.6 Final Report
The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:
- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:
- Final Report Outline (draft and final)

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

Subtask 1.6.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)

    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
    - Comments the recipient proposes to incorporate.
    - Comments the recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

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

CAM Product:
- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of CEC funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

  If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter
- Supplemental Match Funds Notification Letter *(if applicable)*
- Match Funds Reduction Notification Letter *(if applicable)*

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If 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 CEC flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.

- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of each executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

- Subcontracts *(draft if required by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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

- Researchers knowledgeable about the project subject matter;

- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings

The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC meeting.
- Organize and lead TAC meetings in accordance with the TAC Meeting Schedule. Changes to the schedule must be pre-approved in writing by the CAM.

- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

The TAC shall:

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.
- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan.

Products:

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

Subtask 1.12 Project Performance Metrics

The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

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

- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2 ENGINEERING AND DESIGN

The goal of this task is to complete all engineering and design for the proposed reversible solid oxide battery storage system. Engineering and design will include scale up to a 100 kW / 10 MWh capacity system, and will integrate all safety, capacity (energy+power), energy efficiency, regulatory and compliance, and performance requirements. This task will culminate in approved construction documents and construction permits.

The Recipient shall:

- Complete and submit a *System Design Report* that includes all system design needed to scale the proposed system to 100 kW / 10 MWh capacity, including details on:
  - Electrolysis cell/stack integration into 100 kW system requirements.
  - Storage chemical tank modules to accommodate 100 kW peak power and 10 MWh capacity.
  - Non-metal oxide chemicals tank to accommodate 100 kW peak power and 10 MWh capacity.
  - Power management of system components to accomplish at least 50% Round Trip Efficiency (RTE) demonstrating a path towards higher RTE.
  - Component level integration to ensure full operability at the proposed scale.
  - Integration of safety design considerations including thermal management systems, gas safety alarms, containment systems, battery management systems, remote monitoring systems, high power electrical safety systems, and fire suppression systems.
- Design and engineer all site and structural components of the facility, including any requirements for placement of the proposed system, and utility connections and appurtenances.
- Design and engineer electrical components of the project, including all equipment and appurtenances and connections to the proposed LDES system.
- Design and engineer mechanical components of the project, including all equipment and appurtenances and required interconnections.
- Complete all permitting required for the project.
- Prepare and submit a *Notification of Permitting Completion* showing completion status for all required permits.
- Prepare and submit a *Written Notification of Completion of Engineering Plans*. The letter will include, but is not limited to:
  - Final engineering documents.
  - Summary of lessons learned during the design phase.
  - Approval from applicable agencies, as needed to initiate construction.
- Prepare and submit a *Construction and Equipment List* that will be used to develop bid packages to be sent to vendors.
- Prepare and submit a *System Design Report* that provides a review of the engineering and design of the system.

- Prepare and present a *System Design Presentation* which will include but is not limited to:
  - Material and energy balances
  - Process flow diagrams
  - Piping and instrumentation diagrams
  - Control strategy
  - Equipment list
  - Equipment datasheets
  - Single-line diagrams
  - Overview of the engineering and design of the system.
  - Summary of the System Design Report.

Products:

- Notification of Permitting Completion
- Written Notification of Completion of Engineering Plans
- Construction and Equipment List
- System Design Report (draft and final)
- System Design Presentation

TASK 3 PROCUREMENT, FABRICATION/CONSTRUCTION, AND COMMISSIONING

The goal of this task is to complete all equipment procurement, specialty parts fabrication, system construction and integration, installation at the project site, commissioning period testing, and finally, to initiate full facility operation. This task includes detailed subtasks and milestones consistent with traditional construction project management including procurement, installation, and commissioning. Upon successful commissioning, the demonstration period of operation will commence.

The Recipient shall:

- Prepare and submit a *Fabrication and Procurement Plan* for the project that will detail the process for fabrication of needed components and procurement of equipment, materials, and services in a manner that provides transparency into the selection process and the rationale for optimizing the quality of services / equipment provided with price. The *Fabrication and Procurement Plan* will include but will not be limited to:
  - List of components required for fabrication, and details regarding fabrication specifications and requirements.
  - Description of the bid packages to be assembled.
  - Methodology for receiving and evaluating responses.
- Prepare and submit a *Fabrication and Procurement Report* for the project that will detail the completed selection process and justification for the service providers selected. The *Fabrication and Procurement Report* will include, but will not be limited to:
  - List of respondents to bid packages.

  - Review of rationale for the selected service providers, including fabrication service providers.
  - Outcomes of the fabrication and procurement process.
- Prepare and submit a *Construction Plan* for the project that will outline the budget and schedule for the completion of all construction and installation activities. The *Construction Plan* will include, but will not be limited to:
  - List of construction and installation milestones.
  - Gantt chart and detailed project schedule.
  - Description of best management practices to be utilized.
  - Risk mitigation strategy.
  - Plan for quality control and quality assurance.
- Prepare and submit a *Written Notification of Site Preparation* for the project that will notify the CAM that the site has been prepared to initiate construction related activities.
- Implement the *Construction Plan* including all construction and installation related activities.
- Prepare and submit a *Major Project Change List* for the project that will identify any major project changes that occur during implementation of the Construction Plan. The *Major Project Change List* will be updated on an as-needed basis and will include, but is not limited to:
  - Description of the scope of the identified challenge necessitating a material change in the *Construction Plan*.
  - Solution to address the challenge and a rationale for the proposed solution.
  - Updates, as necessary, to the milestones and Gantt chart to reflect the new approach.
- Prepare and submit a *Construction Report* for the project that will evaluate the actual construction activities compared to the *Construction Plan*. The *Construction Report* will include, but will not be limited to:
  - Final schedule of completed milestones.
  - Description of lessons learned.
  - Summary of major project changes.
- Prepare and submit *Written Notification of Completion of Construction and Installation* for the project. This memorandum will notify the CAM that construction and installation activities have been completed.
- Prepare and submit a *Testing and Commissioning Plan* for the project that will detail the processes, deliverables, and milestones needed to complete testing and commissioning of the project. The *Testing and Commissioning Plan* will include, but is not limited to:
  - Description of the equipment to be tested.
  - Description of the methodology to test the identified equipment.
  - List of goals and objectives for each test.
  - Description of the quality control and quality assurance practices for the test methodology.
- Implement the *Testing and Commissioning Plan*.

- Prepare and submit a *Testing and Commissioning Report* for the project that will document and evaluate the test results. *The Testing and Commissioning* Report will include, but will not be limited to:
  - Description of the results for the cold and hot tests for all applicable equipment.
  - Description of any major changes that were made based on findings during the cold or hot testing.
- Prepare and submit a *Written Notification of Completion of Commissioning* for the project that will notify the CAM that all testing and commissioning activities have been completed, and that the project is now ready to commence demonstration period operations.
- Prepare a *CPR Report* #1 in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR #1 meeting.

Products:

- Fabrication and Procurement Plan
- Fabrication and Procurement Report
- Construction Plan
- Written Notification of Site Preparation
- Major Project Change List
- Construction Report
- Written Notification of Completion of Construction and Installation
- Testing and Commissioning Plan (draft and final)
- Testing and Commissioning Report (draft and final)
- Written Notification of Completion of Commissioning
- CPR Report #1

TASK 4 OPERATION VALIDATION AND REPORTING

The goal of this task is to complete a 12+ month demonstration and operation period, during which time the project team will collect operational data and use that data to support system operational validation, reporting, and technology transfer activities.

The Recipient shall:

- Initiate demonstration period system operation and full operability and startup.
- Complete a minimum of 12 months of operation during the demonstration period.
- Collect data during the 12+ month operational period. The following data will be collected on a 15 min basis: kW input, kWh input, kW output, kWh output, charge state and battery status, ramp rates up and down, round trip efficiency, degradation of storage capacity due to cycling (if any), system temperature, CO2 storage tank status and fill amount, solid C storage tank status and fill amount, gas composition sensor analytics, electrolysis stack resistance, temperature and pressure drops at key points, gas safety sensor readings, fire sensor readings, startup/shutdown times, high power electrical safety sensor readings, and safety parameters including system temperature, system faults, and operating / tank pressure. The following data will also be collected: causes of system faults,

safety incidents if applicable + consequence and cause, system maintenance and cause, and associated outcomes.

- Complete and submit *Quarterly Data Reports* (4 total) that compile the above information for review by the CAM at least once every three months.
- Complete and submit a Measurement and Verification (M&V) process, which will include the following:
  - Develop an *M&V Test Plan* that will define the procedures used to obtain experimental data with the system and measure key performance parameters; it will define the instrumentation required, associated quality assurance and calibration required for each instrument, and test procedures for each parameter.
  - Data considered / collected will be consistent with those outlined in previous bullets under this task.
  - The *M&V Test Plan* will also provide for the subrecipient to participate in onsite system performance testing three times during the demonstration period via week-long test campaigns, one projected to occur at the end of, half-way through the testing period, and again at the end of the testing period. The subrecipient will be on site for each test campaign and assist with adherence to the performance test plan and observe the testing being done. Prior to each test campaign, the subrecipient will seek to verify that the host site has performed proper quality assurance on the extant instrumentation. For the first test, the subrecipient will visit the site to inspect the instrumentation and calibration and quality assurance work before the campaign test occurs. The *M&V Test Plan* will further provide for the subrecipient to perform off-site reviews of the system's performance monthly based on data provided remotely throughout the full demonstration period. The *M&V Test Plan* will require results from these reviews to be rolled up into the *Quarterly Data Reports*, as described previously. These reviews will assess the validity of the data provided and calculate performance indicators to be reported. One of the goals of this longer-term review is to calculate availability. These reviews will calculate the same performance indicators as those for the onsite testing. Finally, the off-site performance reviews will provide valuable data on how the system performs under seasonal variations.
  - Execute the M&V Test Plan, which will culminate in the completion of a *M&V Final Report*. The quarterly reports will be completed after the first and second the subrecipient data collection period, while the final report will be completed upon completion of the full M&V testing process.
  - Collect one year of performance data after the project term ends, if the LDES system remains on-site.

Products:

- Quarterly Data Reports (4 total)
- Measurement and Verification Test Plan (draft and final)
- Measurement and Verification Final Report (draft and final)

TASK 5 COMMUNITY BENEFITS

EXHIBIT A
Scope of Work
Noon Energy Inc.

The goal of this task is to ensure and document execution of all community benefits, including workforce development benefits and a demonstration of reduced cost power distribution provided by the project. To this end, the Recipient is working with a local homeless service and the City of West Sacramento to demonstrate electricity cost benefits of the proposed storage technology. The Recipient will also complete targeted outreach and additional community support including educational site tours, education support at local underserved schools and community colleges, three scholarships targeting underserved community members who seek college or technical education in a STEM field, and development of training materials and programming to support future workforce training.

The Recipient shall:

- Provide direct reimbursement payments for project electricity cost savings to enrolled community partners, including to a local homeless service, to the City of West Sacramento Water Treatment Plant, or another partner as approved by CEC, totaling up to $40,000 in reimbursed electricity costs during the demonstration period.
- Develop and submit a *Community Outreach and Benefit Plan* that will include the following elements:
    - Community outreach targeting underserved communities in West Sacramento to provide school tours of the site, as well as in person presentations to high schools, and the West Sacramento Center of Sacramento City College or another college as approved by CEC, to provide educational programs or assemblies that raise awareness of renewable / clean energy and advanced energy storage including the benefits of the Recipient's storage system, and other related clean technologies.
    - Target job postings to underserved communities in West Sacramento through in-community posting and targeted outreach through social media.
    - Develop a project webpage or project dedicated webpage on the Recipient's existing website, plus social media outreach, oriented toward informing the local community regarding project on the progress, milestones completed, and related opportunities, including jobs postings and targeted hiring opportunities.
    - Three $1,500 scholarships (one per year) for graduating high school seniors to enter into a STEM oriented college 2-year, 4-year, or technical degree program.
    - Develop a preliminary workforce training curriculum, consistent with recommendation / requirements of with the International Brotherhood of Electrical Workers Local 340 and the National Electrical Contractors Association of Greater Sacramento, and Northern California Construction Training, or equivalent, to support future workforce training efforts that will encompass installation and maintenance of the Recipients system, once fully commercialized.
    - Community targeted printed materials, jobs postings, social media, and web / email-based outreach will be provided in both English and Spanish.

- Complete three annual *Community Benefits Reports* that summarize community benefits work completed to date and tracks all outcomes including the number of site tours, number of school / community college visits, number of job postings in underserved communities, number of hires, scholarships awarded, and status of workforce training efforts.
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR #2 meeting.

Products:
- Community Outreach and Benefit Plan (draft and final)
- Community Benefits Annual Reports (3 total)
- CPR Report #2

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 *Project Case Study Plan* that outlines how the Recipient will document the planning, construction, commissioning, and operation of the technology or system being demonstrated. The Project Case Study Plan should include:
  - An outline of the objectives, goals, and activities of the case study.
  - The organization that will be conducting the case study and the plan for conducting it.
  - A list of professions and practitioners involved in the technology's deployment.
  - Specific activities the Recipient will take to ensure the learning that results from the project is disseminated to those professions and practitioners.
  - Presentations/webinars/training events to disseminate the results of the case study.
- Present the draft *Project Case Study Plan* to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the draft *Project Case Study Plan*. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the final *Project Case Study Plan*.
  - TAC comments the Recipient does not propose to incorporate into the final *Project Case Study Plan* with an explanation why.
- Submit the final *Project Case Study Plan* to the CAM for approval.

- Execute the final Project Case Study Plan and develop and submit a *Project Case Study*.
- When directed by the CAM, develop *presentation materials for a CEC sponsored conference/workshop(s)* on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Products:

- Project Case Study Plan (draft and final)
- Summary of TAC Comments
- Project Case Study (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.