



**California Energy Commission
April 12, 2023 Business Meeting
Backup Materials for Agenda Item No 3i:
Use Case Analysis and Site Evaluation for Commercial Demonstration of a Long-
Duration Energy Storage System**

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.

STATE OF CALIFORNIA
STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Pattern Solar and Storage Development LLC

WHEREAS, that the State Energy Resources Conservation and Development Commission (CEC) adopts the staff California Environmental Quality Act (CEQA) findings contained and the noncompetitive award determination in the Agreement or Amendment Request Form (as applicable); and

WHEREAS, that the CEC approves Agreement LDS-22-002 with Pattern Solar and Storage Development LLC, for a \$79,600 grant to conduct a use case and market analytics assessment and prepare for commercial deployment of a 5 MW (500 MWh), non-lithium-ion, long-duration energy storage system. This project will assess the capability of an iron-air, multi-day storage system to both support the integration of intermittent renewable resources and provide multiple days of continuous, zero-carbon power to the grid; 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 April 12, 2023.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

Liza Lopez
Secretariat



GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: LDS-22-002

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Yahui Yang
3. MS-:None
4. Phone Number: 916-776-0827

C. Recipient's Information

1. Recipient's Legal Name: Pattern Solar and Storage Development LLC
2. Federal ID Number: 85-0592881

D. Title of Project

Title of project: Use Case Analysis and Site Evaluation for Commercial Demonstration of a Long-Duration Energy Storage System

E. Term and Amount

1. Start Date: 5/1/2023
2. End Date: 1/1/2024
3. Amount: \$79,6000

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 4/12/2023
3. Consent or Discussion? Consent
4. Business Meeting Presenter Name: Yahui Yang
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Research (Energy RD&D / PIER program).

Agenda Item Subject and Description:

PATTERN SOLAR AND STORAGE DEVELOPMENT LLC. Proposed resolution approving Agreement LDS-22-002 with Pattern Solar and Storage Development LLC for a \$79,600 grant to conduct a use case and market analytics assessment and prepare for commercial deployment of a 5 MW (500 MWh), non-lithium-ion, long-duration energy storage system, and adopting staff's determination that this action is exempt from CEQA. This project will assess the capability of an iron-air, multi-day storage system to both support the integration of intermittent renewable resources and provide multiple days of continuous, zero-carbon power to the grid. (LDES Funding) Contact: Yahui Yang



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”:

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.

Cal. Code Regs., tit. 14, sect. 15306 consists 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. This project will collect data and perform resource evaluation for a long-duration energy storage system via use case assessment and experimental tests in a laboratory setting. The activities do not result in any disturbance to an environmental resource. For these reasons, the proposed project will have no significant effect on the environment and is categorically exempt under section 15306.

This project does not involve impacts on any particularly sensitive environment; 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. 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
Form Energy, Inc.	\$ 79,600	\$0
Pacific Gas and Electric Company	\$ 0	\$102,800

I. 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	\$	\$

J. 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
Form Energy, Inc.



K. 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
GENERAL	22-23	303.101	\$ 79,600

TOTAL Amount: \$ 79,600

R&D Program Area: ESRB: ETSI

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

L. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Matt Kowalsky

Address: 1201 Louisiana St Ste 3200

City, State, Zip: Houston, TX 77002-5619

Phone: 414-801-1680

E-Mail: matt.kowalsky@patternenergy.com

2. Recipient’s Project Manager

Name: Matt Kowalsky

Address: 1201 Louisiana St Ste 3200

City, State, Zip: Houston, TX 77002-5619

Phone: 414-801-1680

E-Mail: matt.kowalsky@patternenergy.com

M. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	Not applicable
First Come First Served Solicitation #	Not applicable



Other	This noncompetitive award is authorized under (PRC 25643(d)(3)) because the cost to the state is reasonable and because it is in the best interest of the state to do so. Recipient is a company with resources to facilitate LDES projects and experience in grid-connected, green energy projects in California and around the world, and the battery to be assessed is unique. Moreover, California needs to dramatically increase its energy storage.
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N. Attached Items

- 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	No.

Approved By

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

Agreement Manager: Yahui Yang

Approval Date: 3/30/2023

Branch Manager: Mike Gravely

Approval Date: 3/30/2023

Director: Delegated to Branch Manager

Approval Date: 3/30/2023

**Exhibit A
Scope of Work
Pattern Solar and Storage Development LLC**

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR	Task Name
1		General Project Tasks
2		Use Case & Market Analytics
3	X	Site Evaluation
4		Evaluation of Project Benefits
5		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAISO	California Independent System Operator
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
Form or Form Energy	Form Energy, Inc.
GW	Gigawatt
GWh	Gigawatt-hour
kW	Kilowatt
kWh	Kilowatt-hour
MDS	Multi-Day Storage
MW	Megawatt
MWh	Megawatt-hour
Project host or PG&E	Pacific Gas & Electric Company
Recipient, Pattern, or Pattern Energy	Pattern Solar and Storage Development LLC

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

A. Purpose of Agreement

The purpose of this Agreement is to conduct a use case and market analytics assessment and determine what is necessary for commercial deployment of Form Energy’s 100-hour, iron-air, multi-day storage (MDS) system in California. Pattern Solar and Storage Development LLC (Recipient, Pattern, or Pattern Energy) will be collaborating with Form Energy, Inc. (Form or Form Energy) and Pacific Gas & Electric Company (project host or PG&E) to develop a front-of-the-meter, 5 MW / 500 MWh MDS and evaluate what is needed to interconnect and deploy the system at a potential site.

Exhibit A
Scope of Work
Pattern Solar and Storage Development LLC

B. Problem/ Solution Statement

Problem

The 2021 Senate Bill 100 Joint Agency Report (“SB 100 Report”), found that achieving SB 100’s 2045 goal of 100% renewable and zero-carbon electricity will increase the total annual electricity system costs by nearly \$4.5 billion by 2045 relative to today. In order to achieve this goal, California would need to deploy solar, wind and short-duration storage at a pace of approximately 6 GW per year in order to meet SB 100 decarbonization targets; in other words, solar and wind build rates would need to nearly triple and battery storage build rates would need to increase eightfold.¹ This high cost and massive build-out rate of solar, wind, and short-duration storage is driven in part by the lack of the affordable, zero-carbon, dispatchable resource options that help integrate variable renewable resources and support grid reliability. This absence results in inefficient integration of renewable generation and, by 2045, approximately 35,000 GWh of curtailment annually.²

These results align with the California Energy Commission’s (CEC) earlier finding that “achieving a 100% zero-carbon generation mix . . . appears cost-prohibitive without...new forms of low-cost, long-duration energy storage”³ The importance of long-duration energy storage for firming renewables was again emphasized by the SB 100 Report’s Generic Zero-Carbon Firm Resources Scenario, which modeled firm zero-carbon technologies and found that the inclusion of such resources has the potential to significantly reduce needs for utility-scale solar and battery storage thus reducing the total resource cost by three percent (~\$2 billion in 2016 dollars). However, existing options to store energy for the time scale necessary to firm renewable resources are limited by cost (Li-ion), site availability (pumped hydro), or scale (compressed air and mechanical systems, which also face cost limitations). No commercially available energy storage technologies can cost-effectively meet California’s grid needs.

Solution

Public Resources Code section 2541 provides that the CEC:

Shall establish and implement the Long-Duration Energy Storage Program to provide financial incentives for eligible projects,⁴ located at eligible

¹ See [2021 SB 100 Joint Agency Report](#), SB 100 Core Scenario

² See 2021 SB 100 Joint Agency Report, Central Core and Study Scenario Results

³ See [CEC Deep Decarbonization in an High Renewables Future](#), p. 39

⁴ Under Public Resources Code section 25642, an “eligible project” shall include, but not be limited to, an eligible storage facility that includes any of the following: (i) Compressed air or liquid air technologies; (ii) Flow batteries, advanced chemistry batteries, or mechanical energy storage; (iii) Thermal storage or aqueous battery systems; or (iv) A hydrogen demonstration project. “Eligible project” shall not include a pumped storage project or lithium-ion-based storage technology. Cal. Pub. Res. Code § 25642 (b)(2)(A).

Exhibit A Scope of Work Pattern Solar and Storage Development LLC

storage facilities,⁵ that have power ratings of at least one megawatt and are capable of reaching a target of at least eight hours of continuous discharge of electricity at that power rating in order to deploy innovative energy storage systems to the electrical grid for purposes of providing critical capacity and grid services.⁶

Form Energy's 100-hour, iron-air battery system has a low cost entitlement battery chemistry and is designed to help California address reliability, resilience, decarbonization, and energy affordability challenges.

This project will conduct a use case and market analytics assessment and determine what is necessary for commercial deployment of a new form of low-cost, long-duration energy storage that when deployed at scale, per unit energy, have a total installed cost that is less than 1/10th that of lithium-ion battery technologies and will be able to both support the integration of intermittent renewable resources and provide multiple days of continuous, zero-carbon power to the grid when called upon. The project will assess and use breakthrough battery materials that are safe, abundant, ultra-low-cost, and globally scalable from existing supply chains.

This project will demonstrate a pathway for California to achieve a zero-carbon grid faster and at a lower cost than currently planned while addressing critical near-term grid reliability services during multi-day periods of energy scarcity, extreme weather, wildfires, renewable energy lulls, regional fuel shortages, transmission constraints, and grid infrastructure outages. In addition, the project will yield operational data that will allow utilities, regulators, and grid operators to identify optimal deployment of one of California's most needed asset classes: firm zero-carbon energy resources that can cost-effectively manage the intermittency of renewable resources and ensure grid reliability, without the need for legacy thermal generation, even during extreme weather conditions and other grid contingencies.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Conduct a use case and market analytics assessment for a Form MDS 5MW / 500 MWh multi-day energy system.
- Evaluate sites that may house the Form MDS 5MW / 500 MWh multi-day energy storage system.
- Increase industry knowledge about how Form Energy's technology can provide a cost-effective zero-carbon energy storage solution to the challenges of:

⁵ Eligible storage facility" shall include, but not be limited to, an energy storage system that is interconnected to the electrical grid in California or to a California balancing authority. Cal. Pub. Res. Code § 25642.

⁶ Cal. Pub. Res. Code § 25641.

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- Providing firm, dispatchable, zero-carbon capacity to avoid the need for natural gas plants to maintain grid reliability
- Enabling firm renewable energy during any weather condition
- Optimizing the utilization of transmission assets
- Enabling electric resilience during multiple days of extreme weather or other grid emergencies
- Identify barriers to the efficient participation of MDS in California Independent System Operator (CAISO) markets.

First, as indicated by the modeling results included in the SB 100 report, the commercialization of firm, zero-carbon resources has the potential to significantly reduce the ratepayer cost impacts of achieving California's electric decarbonization goals. A large portion of these cost savings will be achieved by reducing the need for solar and other resources, and a reduction of land-use impacts associated with building a zero-carbon electric grid.

This project will preliminarily assess a technology that can provide power to the grid even during multi-day events, which will support reliability at a system level. In addition, Form Energy's iron-air battery is well-suited for resiliency applications and will be able to provide back-up power during black-outs and Public Safety Power Shutoff events. Hence, this project can demonstrate and enable a pathway to simultaneously support both reliability and resilience needs without the need for fossil fuels.

In addition, modeling conducted by Form Energy and Energy and Environmental Economics, Inc. as part of a CEC-funded project indicates that, if sufficient long-duration storage resources are available, California can, by 2045, decarbonize its electric grid beyond established SB 100 goals, achieve fully zero-carbon in-state generation, and greatly reduce the need for in-state thermal generation at near cost parity with SB 100 status quo. By greatly reducing the need for in-state thermal generation, Form Energy's iron-air MDS technology will improve the health and safety of Californians by both reducing local air pollution and enabling additional reductions in greenhouse gas emissions.

This Agreement is intended to lead to technological advancement and breakthroughs to overcome barriers to achieve the State of California's statutory energy goals by advancing the commercialization of Form Energy's ultra-low-cost, multi-day energy storage technology made from safe, globally abundant materials. If successful, this new class of energy storage would help achieve California's goals to cost-effectively and reliably integrate a 100% renewable and zero-carbon grid by 2045, and to support zero-carbon microgrid configurations and customer energy resiliency in the event of grid outages.

Agreement Objectives

The objectives of this Agreement are to:

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Pattern Solar and Storage Development LLC

- Conduct use case and market application analytics to identify optimal MDS system operation and to maximize project value at potential project sites.
- Complete site selection through an evaluation process to determine the most optimal location for a 5MW installation with a project host.

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Pattern Solar and Storage Development LLC

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:

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Instructions for Submitting Electronic Files and Developing Software:

○ **Electronic File Format**

- Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission’s software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM.

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format.
- The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

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);
- Subcontracts (subtask 1.8); and
- Any other relevant topics.

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Pattern Solar and Storage Development LLC

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);
 - 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 and Match Funds 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*)

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 mutually by the CAM and the Recipient Project Manager.

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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.
- 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

Exhibit A Scope of Work Pattern Solar and Storage Development LLC

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*.

Products:

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

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 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 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 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.

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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.)

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- Bibliography (if applicable)
- Appendices (if applicable) (Create a separate volume if very large.)
- Attachments (if applicable)
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any *Written Responses to Comments* within 10 days of receipt of CAM's *Written Comments on the Draft Final Report*, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Draft Final Report
- Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS 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

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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 Contractor may incur any costs related to the use of the permit(s) for which the Contractor will request reimbursement.

The Contractor 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.

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- The schedule the Contractor 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.

Deliverables:

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

Subtask 1.9: Subcontracts

The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final redacted 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*)

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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.

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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.

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- 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 an 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

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TECHNICAL TASKS

Products that require a draft version are indicated by marking “(draft and final)” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required.

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

IV. TASK 2: USE CASE AND MARKET APPLICATION ANALYTICS

The goal of this task is to develop use case scenarios associated with Form Energy’s MDS system and conduct a market application analysis to inform site evaluation and determine relevant use cases for the commercial demonstration.

Subtask 2.1: Create Relevant Load and Generation Profiles and Use Case Scenarios

The goal of this subtask is to determine relevant use cases that pertain to the commercial demonstration of Form Energy’s MDS system.

The Recipient shall:

- Work with the project host to determine how the commercial demonstration can be most valuable at the project and portfolio level in diverse front-of-meter grid applications. Applications considered could include: enabling firm renewable energy supply; delivering dispatchable zero carbon capacity to replace gas plants for reliability; enabling resilience; optimizing transmission or distribution equipment utilization (as applicable); risk hedging.
- Produce load, generation and MDS dispatch profiles optimized for a potential project site.
- Produce a *Use Case Scenario Report* that includes a summary of the assessment.

Product:

- Use Case Scenario Report (Draft and Final)

Subtask 2.2: Complete Market Application Analysis

The goal of this subtask is to determine how the commercial demonstration of Form Energy’s MDS system is expected to perform in the CAISO market.

The Recipient shall:

- Identify barriers to MDS participation in CAISO markets.
- Produce a *CAISO Market Application Analysis Report* that includes a summary of the assessment.

Products:

- CAISO Market Application Analysis Report (Draft and Final)
 - This report should not disclose any confidential information.

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V. TASK 3: SITE EVALUATION

The goal of this task is to evaluate and select a site in California that is within the CAISO balancing area authority and has existing interconnection capacity suitable to serve as the location of the commercial demonstration. As part of the site evaluation, a permit evaluation will be completed.

Subtask 3.1: Site Evaluation

The goal of this subtask is to evaluate and select a site for commercial demonstration of an MDS system.

The Recipient shall:

- Complete any necessary surveys required to evaluate potential sites (soil and geotechnical surveys, topographical surveys etc.).
- Generate a *Site Survey Report* that includes a summary of the survey report impacts to the project budget & schedule.
- Travel to the potential sites to gain an on-the-ground understanding of the implications of having an operational MDS system at that site.
- Develop a *Site Evaluation Report* that includes a completed evaluation matrix of the anticipated site.

Products:

- Site Survey Report
- Site Evaluation Report (Draft & Final)

Subtask 3.2: Permit Evaluation

The goal of this subtask is to evaluate what permits are required for an LDES storage facility at the anticipated site location. No permits will be obtained under this Subtask.

The Recipient shall:

- Prepare a *Permit Evaluation Report* that includes:
 - List of construction permits necessary and associated authorities having jurisdiction
 - Schedule for acquiring the permits

Products:

- Permit Evaluation Report

VI. TASK 4: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete the *Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.

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- 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 \(www.energizeinnovation.fund\)](http://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 \(www.energizeinnovation.fund\)](http://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

VII. TASK 5: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the technological learning that resulted from the demonstration(s) is captured and disseminated to the range of professions that will be responsible for future deployments of this technology or similar technologies.

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.

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- 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 *Technology Transfer Plan*.
 - TAC comments the recipient does not propose to incorporate 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 knowledge sharing event(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

VIII. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.