



**California Energy Commission
July 26, 2023 Business Meeting
Backup Materials for Agenda Item No 11a:
University of Maine System Acting Through the University of Maine (University
of Maine)**

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: University of Maine System Acting Through the University of
Maine (University of Maine)**

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-23-005 with the University of Maine for a \$2,162,676 grant to develop a taut-synthetic integrated mooring system for a floating offshore wind turbine platform. The project will emphasize reducing and optimizing hardware and connections, as well as increasing commercial feasibility and ease of installation; 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 July 26, 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: EPC-23-005

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Mark Danielson
3. MS-:51
4. Phone Number: (916) 805-7515

C. Recipient's Information

1. Recipient's Legal Name: University of Maine System Acting Through the University of Maine
2. Federal ID Number: 01-6000769

D. Title of Project

Title of project: Design, Validation, and Certification of a Synthetic Mooring Line System for a 15+ MW Floating Wind Turbine in the Humboldt Bay Wind Energy Area

E. Term and Amount

1. Start Date: 8/1/2023
2. End Date: 3/31/2027
3. Amount: \$2,162,676

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 7/26/2023
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Mark Danielson
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

University of Maine System Acting Through the University of Maine (University of Maine). Proposed resolution approving agreement EPC-23-005 with the University of Maine for a \$2,162,676 grant to develop a taut-synthetic integrated mooring system for a floating offshore wind turbine platform, and adopting staff's determination that this action is exempt from CEQA. The project will emphasize reducing and optimizing hardware and connections, as well as increasing commercial feasibility and ease of installation. (EPIC funding) Contact: Mark Danielson



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, § 15301;

Common Sense Exemption? 14 CCR 15061 (b) (3)

No

This project will involve research on synthetic mooring line materials and testing done at existing locations and facilities. There will be negligible to no expansion of the existing use of the facilities. For these reasons, the project will not have a significant effect on the environment and the project is categorically exempt under California Code of Regulations, title 14 section 15301.

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
American Bureau of Shipping	\$ 45,000	\$5,000
TBD	\$ 45,000	\$5,000
TBD	\$ 45,000	\$5,000

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
No key partners to report

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
EPIC	21-22	301.001I	\$ 2,162,676

TOTAL Amount: \$ 2,162,676

R&D Program Area: EGRB: Renewables

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: Cathy Dionne-Gass

Address: 35 Flagstaff Road

City, State, Zip: Orono, ME 04469-5717

Phone: 207-581-2769

E-Mail: gass@composites.maine.edu

3. Recipient's Project Manager

Name: Spencer Hallowell

Address: 35 Flagstaff Road

City, State, Zip: Orono, ME 04469-0001

Phone: 207-751-4174

E-Mail: spencer.hallowell@composites.maine.edu

M. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-22-402
First Come First Served Solicitation #	Not applicable
Other	Not applicable

N. Attached Items

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

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



STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Grant Request Form
CEC-270 (Revised 9/2022)

Approved By

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

Agreement Manager: Mark Danielson

Approval Date: 06/1/2023

Branch Manager: Kevin Uy

Approval Date: 6/2/2023

Director: Delegated to Branch Manager

Approval Date: 6/2/2023

Exhibit A
Scope of Work
University of Maine System Acting Through the University of Maine

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		General Project Tasks
2		Design of Deep-water Mooring to 25% FEED
3		Scale Model Test of Deep-water Mooring Design
4	X	Construction, Operation, Decommissioning, and Risk Assessment
5		Design of Deep-water Mooring to 50% FEED
6		Approval in Principle
7		Environmental Assessment
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
ABS	American Bureau of Shipping
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
CVA	Certified Verification Agent
FEED	Front End Engineering Design
FOWT	Floating Offshore Wind Turbine
MW	Megawatt
O&M	Operations and Maintenance
Recipient	University of Maine
TAC	Technical Advisory Committee
TRL	Technology Readiness Level
WEA	Wind Energy Area

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.

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

A. Purpose of Agreement

The purpose of this Agreement is to develop a taut-synthetic integrated mooring system, with emphasis on reducing and optimizing hardware and connections, increasing ease of installation, and adaptability to specific seafloor conditions in California Wind Energy Areas (WEAs). The goal is to advance the front-end engineering design (FEED) level of the novel mooring system to achieve third-party Approval in Principle Process from a certified verification agent (CVA) and increase commercial feasibility, as verified by the American Bureau of Shipping (ABS) Approval in Principle Process, in offshore wind energy development.

B. Problem/ Solution Statement

Problem

California's goals of 5,000 megawatts (MW) of offshore wind by 2030 will require approximately 1,000 km total length of mooring lines, while 25,000 MW of offshore wind by 2045 will require upwards of 4,500 km total length of mooring lines. The current worldwide supply of mooring chain cannot meet such demand, and therefore the adoption of synthetic rope mooring systems will be necessary to accelerate the deployment of Floating Offshore Wind Turbine (FOWT) mooring systems. The current state of the art of synthetic mooring systems is limited to oil and gas installations and shallow to intermediate FOWT deployments. Deepwater taut-synthetic mooring systems deployed in California WEAs will need to be optimized to reduce hardware and connections while also increasing ease of installation due to significant weather window constraints present in the California offshore environment. In addition, any mooring system in a California WEA must withstand site-specific and technology-specific conditions, including length due to water depths between 550 and 1,300 meters, handling, and installation of the moorings with commercially available vessels, weight of the platforms, forces due to wind speed and storms, and seismicity. Developing a novel taut-synthetic mooring system that suits these specific conditions will require advancing the design to a 50% FEED level through careful modeling of the viscoelastic material properties, coupled system dynamics, and scaled model testing in an appropriate wave basin, and would result in a critical progress step for this technology to undergo an Approval in Principle process, a risk and integrity review with commercial developers to de-risk the technology, and gain acceptance amongst developers, certification agencies, and stakeholders in the offshore wind industry.

Solution

The Recipient and its team will develop a taut-synthetic integrated mooring system to the 50% FEED level, with emphasis on reducing and optimizing hardware and connections, while increasing ease of installation. The mooring system performance will be confirmed through a third-party review with a CVA, such as the ABS and a scale model test at the University of Maine Wind Wave Basin, a world leading facility for testing offshore renewable energy infrastructure. ABS will be a project partner and act as a CVA and will evaluate key project deliverables as part of their Approval in Principle Process. A mooring risk and integrity management program will be developed with help from an experienced industry partner to

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ensure a reliable and resilient mooring system is designed to reduce future project risks and increase commercial viability.

The Recipient's team includes leading experts in environmental sustainability of offshore projects and will assess environmental impact throughout the design process of the mooring system to ensure that impacts are minimized.

The resulting mooring system design will occur over a 3-year period increasing the Technology Readiness Level of taut-synthetic mooring systems for deep water from Level 3 to Level 4, as confirmed by the model test and an Approval in Principle letter from a CVA. The proposed mooring system will reduce capital expenditure costs of the mooring by up to 50% when compared to a baseline steel cable system and provide a mooring design to make development of offshore wind in California and West Coast markets more feasible to be confirmed by an experienced industry partner, all while minimizing environmental impacts to the seabed.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Advance the design of a deep-water synthetic mooring system for floating offshore wind turbine platforms) to 50% FEED to achieve reductions in hardware and connections and increase ease of installation.
- Increase commercial viability through validating the mooring system through scale modeling in the recipient's W2 Wind Wave Basin and achieving third-party Approval in Principle from a CVA.
- Ensure the novel mooring system's lifecycle is de-risked and mooring integrity is maintained while limiting environmental impacts of the mooring system.
- Optimize cost-competitiveness by developing cost estimates to allow comparison to baseline deep-water moorings.

Ratepayer Benefits:² This Agreement will result in the ratepayer benefit[s] of:

- Reduced Levelized Cost of Energy by decreasing capital expenditure costs of mooring system by up to 50% when compared to chain systems
- Lay groundwork for industrialization of mooring systems for FOWT development and deployment in California, leading to workforce and infrastructure improvements and efficiency for handling of FOWT equipment

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 advancing the state of mooring line technology specific to California WEAs.

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).

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The proposed research will develop a 25% FEED mooring design for the chosen WEA, which will then be validated and de-risked through a scaled model test in the Recipient's W2 Wind Wave Basin, site-specific environmental impact investigation, and a risk management workshop and mooring integrity management plan. The information gathered from the three intermediate tasks will inform and advance the design to a 50% FEED level, which will then undergo an Approval in Principle process with a CVA, resulting in a certification letter and TRL advancement from 3 to 4. This research will serve to support the achievement of the State of California's statutory energy goals by significantly reducing the logistics associated with mooring deployment as compared to chain mooring systems.

Agreement Objectives

The objectives of this Agreement are to:

- Design a deep-water taut-synthetic mooring system specific to California WEAs to 50% FEED.
- Validate the mooring system through scale modeling in the recipient's W2 Wind Wave Basin.
- De-risk the mooring system through life cycle, including mooring integrity management and risk management.
- Increase TRL from 3 to 4, verified by Approval in Principle letter from a CVA.
- Develop cost estimates to allow comparison to contemporary deep-water moorings.
- Complete an environmental review of the technology as compared to a baseline system.

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

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. 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.

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- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

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

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software:

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

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

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

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

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

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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*.

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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.

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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

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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:

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- 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.

Exhibit A Scope of Work University of Maine System Acting Through the University of Maine

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.

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The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
 - The schedule the Recipient will follow in applying for and obtaining the permits.

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of each executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

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

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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. **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.

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- 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.

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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

TECHNICAL TASKS

Products that require a draft version are indicated by marking “(draft and final)” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. Subtask 1.1 (Products) describes the procedure for submitting products to the CAM.

TASK 2: DESIGN OF DEEP-WATER MOORING TO 25 PERCENT FEED

The goal of this task is to develop a preliminary design of a commercial-scale FOWT using taut-synthetic mooring system. The team will work with an experienced industry partner to determine appropriate turbine sizing, and with rope manufacturers, engineering firms, developers, and classification societies to identify the best materials, and hardware, including load reduction devices, for the application. Additionally, the team will validate mooring material suitability for conditions representative of Humboldt Bay WEA.

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The Recipient shall:

- Prepare a *Basis of Design Report* for taut-synthetic mooring system for California WEAs to be reviewed and approved by ABS, that describes, at a minimum:
 - Governing design standards
 - Design philosophy and assumptions (corrosion rates, marine growth, design load conditions, etc.)
 - Metocean conditions
 - Geotechnical parameters necessary for anchor design
 - Seismicity
 - Bathymetry
 - Storm, and other site-specific design considerations to be used as the basis to produce designs for Tasks 3 and 5.
- Consult with TAC on *Basis of Design Report* to verify technical feasibility in accordance with subtask 1.10 (Technical Advisory Committee). Incorporate TAC feedback into the *Basis of Design Report* as appropriate.
- Perform the following activities to select a synthetic rope material best suited to conditions outlined in *Basis of Design Report* and validate its suitability for use at the site, including but not limited to:
 - Consult with rope manufacturers to obtain relevant material properties
 - Use preliminary numerical checks such as frequency domain analysis to screen potential synthetic rope materials and configurations
 - Integrate alternative mooring materials or load reduction devices as needed
 - Life cycle considerations such as seabed contact, marine growth, UV vulnerability, fatigue, and cut resistance.
 - Design the mooring system in such a way that shared anchor systems can be used
- Provide a *Material Selection Summary* that includes descriptions of the selected materials, including rope characteristics.
- Prepare a *Loop 1 Design Report of 25% FEED* of a taut-synthetic mooring system in California WEAs that describes the following tasks, including but not limited to:
 - Complete Loop 1 design of 25% FEED for a taut-synthetic mooring system. 25% FEED is defined as follows:
 - Conduct fatigue and ultimate limit state analysis for several candidate mooring systems
 - Size mooring system and all associated components (chains, lines, cables, load reduction devices and hardware) with schematic drawings and bill of quantities
 - Conduct iterative process of optimizing mooring layout to minimize cost
 - Conduct fully coupled analysis of turbine, platform, and mooring system to obtain accurate mooring performance
 - Reflect appropriate mooring material visco-elastic behavior through numerical models
 - Develop preliminary global performance metrics
 - Conduct preliminary fatigue assessment of any steel hardware components
- Submit *Loop 1 Design Report of 25% FEED* to CAM and ABS for review and approval.

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Products:

- Basis of Design Report (draft and final)
- Material Selection Summary
- Loop 1 Design Report of 25% FEED (draft and final)

TASK 3: SCALE MODEL TEST AND GLOBAL PERFORMANCE ASSESSMENT

The goal of this task is to advance the taut-synthetic mooring system for the Humboldt Bay WEA to a TRL of 4 by conducting a state-of-the-art laboratory scale model test at University of Maine's Harold Alfond W2 Ocean Engineering Laboratory. State-of-the-art testing with active control of both a scale model wind turbine and mooring system provide realistic performance characteristics. This technology verification testing will support Task 9 for technology transfer funding requirements.

The Recipient shall:

- Prepare a *Scale Model Test Plan* for a scale model test of the 25% FEED of taut-synthetic mooring system designed for California WEAs using a generic semisubmersible sized for the International Energy Agency Wind Technology Collaboration Program 15 MW reference wind turbine models. The test plan will describe:
 - Test objectives, system properties, mooring response requirements, instrumentation requirements, environmental conditions, and test procedures.
- Modify Recipient's previous, shallow-water, mooring system design to achieve the high declination angles associated with deep water moorings and prepare a *Modification/Fabrication of Scaled Hull Presentation*.
- Design and verify Recipient's active mooring system for deep water moorings and prepare a *Design and Verification Summary Report*.
- Prepare a numerical "model-of-the-model" using OrcaFlex™ (or equivalent software) to tune the active mooring system and to compare experimental and numerical results.
- Execute the test plan, keeping a daily log and reporting progress to the CAM.
- Prepare a comprehensive *Scale Model Test Report*, that describes, at a minimum:
 - Processed experimental results from the test plan.
 - Comparison with numerical models.
 - How the results should be used in future design stages.
 - Results of the risk assessment as described in the *Risk Identification Summary Presentation*.

Products:

- Scale Model Test Plan
- Modification/Fabrication of Scaled Hull Summary Presentation
- Design and Verification Summary Report
- Scale Model Test Report (draft and final)

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TASK 4: CONSTRUCTION, OPERATION, DECOMMISSIONING, AND RISK ASSESSMENT

The goal of this task is to work with rope manufacturers, engineering firms, developers, and classification societies to develop a construction and operations plan that is feasible for utility-scale FOWT deployment to satisfy lifecycle assessment requirements listed in the GFO-22-402 solicitation. Risk assessment will be addressed through a mooring risk workshop and development of a mooring integrity management report. This detailed strategy report will be essential in advancing this technology to the 50% FEED level and is a vital input to the Approval in Principle (Task 6). Available or proposed handling vessels and port facilities will be used in the strategic planning of the installation procedures required for the mooring system.

The Recipient shall:

- Develop a *Construction and Operations Plan* for taut-synthetic mooring lines in California WEAs that includes the results and recommended strategies garnered from the following activities:
 - Consult with mooring and anchor installation experts to create mooring installation procedures that are scalable to the farm level and provides vessel and hardware sizing necessary for installation.
 - Lay out the mooring system areas of impact, that include, but are not limited to, the ecologic, benthic environment, fisheries, navigation, and visual impacts.
 - Work with line manufacturer and mooring experts to develop an O&M plan that addresses cleaning and inspection requirements.
 - Draft a plan for decommissioning of turbines and mooring systems at utility scale, including investigating re-powering of moorings through the re-use of lines.
- Research supply chain logistics for material manufacturing, including costs and compatibility with existing California supply chain to determine what supply chain additions/improvements are needed to deploy moorings at commercial/utility scale.
- With CAM direction, host a risk management workshop dedicated to the proposed mooring system design and provide the following materials:
 - Workshop agenda, panel topics and panelists, and presentation materials, as requested by the CAM
 - Stakeholder invitee list, including other public agencies, developers, line manufacturers, mooring installation experts, and ABS as a certification body
 - A *Mooring System Risk Summary*, which summarizes discussions and findings from the workshop
- Conduct a reliability assessment of the mooring system, and prepare a *Mooring Integrity Management Report*, which includes but is not limited to, a discussion on an assessment of the reliability of the mooring system for both ultimate limit states and fatigue limit states and compares to intended reliability levels in the design codes.
- Prepare a *CPR Report #1* and participate in a CPR Meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- Construction and Operations Plan (draft and final)
- Mooring System Risk Summary
- Mooring Integrity Management Report
- CPR Report #1

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TASK 5: DESIGN OF DEEP-WATER MOORING TO 50 PERCENT FEED

The purpose of this task is to use the knowledge gained from Tasks 2-4 to improve and update the mooring system design to a 50% FEED level for a proposed FOWT farm layout, which will include full fatigue analysis and detailed hardware specifications for a 30-turbine farm. The design will also be future proofed for the next generation of turbines of 20 MW and above, by conducting a sensitivity analysis of the proposed mooring design to changing turbine loads. Detailed drawings of the proposed mooring system will be developed and used to provide cost estimates of the system to satisfy economic assessment requirements from the GFO-22-402 solicitation manual.

The Recipient shall:

- Conduct the following tasks and develop a *Loop 2 Design Summary Presentation* of the mooring system developed in Task 2 to include update data from Tasks 3, 4, and 7 to a 50% FEED level, which includes:
 - Fully coupled analysis of ABS design load conditions, including required random seeds to obtain extreme value statistics of controlling design conditions.
 - Farm scale layout effects specific to the California WEAs (variable bathymetry, geotechnical, metocean conditions, etc.)
 - Integration of the *Construction and Operations Plan*, including the installation, operation, maintenance and decommissioning strategy, as part of analyses. For example, a load case for the tow out of the turbine and associated ultimate and fatigue loads on the mooring system is included with 50% FEED, but not at 25% FEED.
 - Final schematic drawings of general system and detailed components, material and equipment list
 - Detailed installation and O&M strategy that includes, but is not limited to, step by step procedures and imagines outlining the installation process, the vessels used, the hardware required (bollard pull ratings, winch and crane capacities, etc.), durations for each installation task, maintenance (including what equipment/vessels are necessary) and decommissioning
- Develop a *Taut-Synthetic Mooring System for a California WEA Drawing Package* of mooring system and appropriate hardware to the level that a vendor may quote components of the system
- Assess feasibility of alternative materials, load reduction devices, and shared anchors
- Prepare *Design Report of 50% FEED* of a taut-synthetic mooring system in a California WEA, that includes, at a minimum:
 - Fully coupled analysis
 - Full assessment ABS specified Ultimate Limit State and Fatigue Limit State design load cases
 - Global performance of platform, including offsets and mooring touchdown assessments
 - Full set of anchor design loads and anchor sizing
 - Sensitivity analysis of mooring system to turbine size for future proofing

Products:

- Loop 2 Design Summary Presentation
- Taut-Synthetic Mooring System Drawing Package
- Design Report of 50% FEED of a Taut-Synthetic Mooring System (draft and final)

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TASK 6: OBTAIN APPROVAL IN PRINCIPLE

The goal of this task is to obtain an ABS Approval in Principle for the proposed mooring system from a CVA such as the ABS. The final design of the commercial-scale FOWT synthetic mooring system produced in Task 4 will undergo third-party review to verify the system's integrity and performance. An Approval in Principle process conducted by ABS will ensure the design meets the requirements for class certification and will certify the TRL of 4 obtained by completing Tasks 2-5. The independent design verification will support Task 9 for technology transfer funding requirements.

The Recipient shall:

- Submit all necessary documentation to ABS for Approval in Principle Process
 - Respond to ABS comments on design submittals and revise as necessary
- Obtain *Approval in Principle Letter for a Taut-Synthetic Mooring System*

Products:

- Approval in Principle Letter for a Taut-Synthetic Mooring System

TASK 7: ENVIRONMENTAL ASSESSMENT

The goal of this task is to evaluate the potential environmental risks and impacts to benthic or habitat disturbances of the mooring system, and to provide guidance to design changes to limit impacts to at least the level of the baseline technology reflecting commonly used deep water moorings (cable/polyester) appropriate to California WEA conditions, if not reduce impacts overall.

The Recipient shall:

- Conduct a risk assessment, prepare a *Risk Identification Summary Presentation* and present the summary presentation to CEC, which summarizes findings from the following task:
 - Identify risks associated with floating offshore wind turbine mooring systems with consideration of relevant benthic (on or below the seabed) or ocean habitat (in the water column) disturbances, including but not limited to, deep-sea corals, sponge assemblages, rocky hard-bottom habitat/Essential Fish Habitat, pockmarks, entanglement, and installation noise.
- Prepare a *Baseline System Selection Summary Presentation*, which provides design input to minimize environmental impacts and includes findings from the following activities:
 - Select a baseline system for comparison to proposed mooring technology using industry input to verify current outlook for likely technology and system designs.
 - Conduct desk top study comparing impacts of proposed system against the baseline using publicly available data
- Publish *Environmental Assessment Report* that describes, at a minimum:
 - Environmental assessment of final technology
 - Identified risks associated with floating offshore wind turbine mooring systems.
 - Comparison of environmental impact assessment findings for final technology with a baseline system.

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Products:

- Risk Identification Summary Presentation
- Baseline System Selection Summary Presentation
- Environmental Assessment Report (draft and final)

TASK 8: EVALUATION OF PROJECT BENEFITS (*Mandatory task*)

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 at 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 9: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES (*Mandatory task*)

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.

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- Legal services or licensing to secure necessary intellectual property to further develop the technology
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

The Recipient Shall:

- Develop and submit a Technology Transfer Plan that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the draft *Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Technology Transfer Plan. This document will identify:
 - TAC comments the recipient proposes to incorporate into the final *Technology Transfer Plan*.
 - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the final *Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in final *Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Products:

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

IV. PROJECT SCHEDULE

Please see attached Project Schedule.