California Energy Commission
August 09, 2023 Business Meeting
Backup Materials for Agenda Item No 11:
Triton Anchor LLC

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

RESOLUTION NO: 23-0809-11

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Triton Anchor LLC

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

RESOLVED, that the CEC approves agreement EPC-23-007 with Triton Anchor LLC for a $3,447,131 grant to develop a floating offshore wind turbine anchor system. The anchor system will be specifically designed for California's dynamic soil conditions, based on technology involving helical piles grouped together to provide greater holding capacity; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the CEC held on August 09, 2023.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 9/2022)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-23-007

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Chuck Gentry
3. MS-:43
4. Phone Number: 916-776-0761

C. Recipient's Information

1. Recipient's Legal Name: Triton Anchor LLC
2. Federal ID Number: 92-1047556

D. Title of Project

Title of project: Advanced Anchoring System for California Floating Offshore Wind

E. Term and Amount

1. Start Date: 9/1/2023
2. End Date: 3/31/2027
3. Amount: $3,447,131.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 8/9/2023 .
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: Enter the email subscription topic name.

Agenda Item Subject and Description:

TRITON ANCHOR LLC. Proposed resolution approving agreement EPC-23-007 with Triton Anchor LLC for a $3,447,131 grant to develop a floating offshore wind turbine anchor system, and adopting staff's determination that this action is exempt from CEQA. The anchor system will be specifically designed for California's dynamic soil conditions, based on technology involving helical piles grouped together to provide greater holding capacity. (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":

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

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

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

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

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

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

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

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

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

This project will involve technical research of an anchor system for floating offshore wind farms in California. The project involves work in existing offices and laboratories and collection of data on the ocean floor. The geotechnical and soils work on the sea floor includes methods to determine the density, strength, and composition of the sea floor. The Triton team will deploy a Cone Penetration Test (CPT) rig along with shear-wave velocity instrumentation from a vessel to the seafloor. According to the Recipient, CPT is a method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy. Shear-wave tests are a non-destructive method to determine soil classification, These basic data collection, research, experimental management, and resource evaluation activities do not result in serious or major disturbance to an environmental resource. For these reasons, the project will not have a significant effect on the environment. Therefore, the project is categorically exempt under California Code of Regulations, title 14 section 15306.

As described in Triton Anchor LLC's "California Environmental Quality Act (CEQA) Compliance Form" (revised) submitted to the CEC, the U.S. Bureau of Ocean Energy Management (BOEM) has performed Final Environmental Assessments (EA) on the two, current, federal wind lease areas off the California coast (Humboldt and Morro Bay). For each wind lease area, BOEM reached a "Finding of No Significant Impact." These environmental studies covered site assessment work prior to wind power facility deployment.

The project will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve any cumulative impacts of

successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project site is not included on any list compiled pursuant to Government Code section 65962.5; and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.
IMPORTANT: consult with the legal office to determine next steps.

No

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

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

H. 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**
The Regents of the University of California on behalf of the Davis Campus	$ 495,330	**$**0
WSP USA Inc.	$ 315,820	**$**126,820
Haley & Aldrich, Inc	$ 357,483	**$**131,707
Crowley Engineering Services, Inc.	$ 51,945	**$**29,445
Deep Reach Technology Inc.	$ 0	**$**98,000
Glosten, Inc.	$ 0	**$**548,750
FibreMax BV		$ 30,000
GMC, LTD.		$ 30,000
To Be Determined (assist with anchor interface requirements)		$ 99,000

Subcontractor Legal Company Name	CEC Funds	Match Funds
WSP AUSTRALIA		$ 84,074

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
Continental Shelf Associates, Inc.	**$**710,820	**$**0

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	$ 3,447,131

TOTAL Amount: $ 3,447,131

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: . Contracts Department

Address: 330 Billerica Rd Ste 200 Suite 200

City, State, Zip: Chelmsford, MA 01824-4140

Phone: 978-250-4200

E-Mail: contracts@tritonanchor.com

3. Recipient's Project Manager

Name: Zachary Miller

Address: 330 Billerica Rd Ste 200 Suite 200

City, State, Zip: Chelmsford, MA 01824-4140

Phone: 252-256-0055

E-Mail: zmiller@tritonanchor.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 #	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

Approved By

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

Agreement Manager: Chuck Gentry

Approval Date: 6/2/2023

Branch Manager: Kevin Uy

Approval Date: 6/2/2023

Director: Kevin Uy on behalf of Angela Gould

Approval Date: 6/2/2023

Exhibit A
Scope of Work
Triton Anchor LLC

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR [1]	Task Name
1		General Project Tasks
2		Geotechnical Investigation
3		Marine Life and Habitat Assessment
4		Local Communities Impact
5		California Supply Chain Assessment
6	X	Seismotectonic and Site Characterization
7		Floater Mooring Analysis
8		Baseline Anchor Design
9		Centrifuge Testing
10		Numerical Analysis Validation
11		Anchor Solution Comparison
12		Evaluation of Project Benefits
13		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
API	American Petroleum Institute
BOEM	Bureau of Ocean Energy Management
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
CPT	Cone Penetration Test
FOW	Floating Offshore Wind
FOWT	Floating Offshore Wind Turbine
GIS	Geographical Information System
HSR	High Speed Rail
MOU	Memorandum Of Understanding
NOAA	National Oceanic and Atmospheric Administration
NOWRDC	National Offshore Wind Research & Development Consortium
RAO	Response Amplitude Operators
Recipient	Triton Anchor LLC
RP	Recommended Practice
TAC	Technical Advisory Committee
TLP	Tension Leg Platform

[1] Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

Acronym/Term	Meaning
WEA	Wind Energy Area
WSD	Working Stress Design

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the technology development of the Recipient's helical anchoring system which will address specific challenges California has for Floating Offshore Wind (FOW), and will advance the Recipient's helical anchoring system design for the site-specific conditions found off the coast of California including seismicity and soil conditions. Economic impacts to local communities, California and regional supply chains, and environmental impacts will also be evaluated.

B. Problem/ Solution Statement

Problem

Today's anchoring systems for offshore energy were designed for the oil & gas industry with different site-specific conditions than California, for which offshore geotechnical data does not exist. With the recent completion of the first federal offshore wind leases for sites off the coast of California, it is paramount to address anchoring systems design that consider the site-specific conditions and reduce costs while enabling local manufacturing and reduced wildlife impacts.

Anchor designs relevant to the California Wind Energy Areas (WEA) need to be tailored to their seabed conditions, including soil type, water depth, and seabed slope, and will need to withstand seismic hazards, such as earthquakes, tsunamis, and liquefaction. No commercially available anchor design can meet these requirements.

Solution

The Recipient has developed a novel anchoring system optimal for floating offshore wind. The anchoring system uses deep embedment helical piles which are known to have excellent resistance to seismic hazards. The novel anchoring system reduces the cost of anchoring by using highly efficient capacity holding helical piles to reduce the overall weight of the system, bringing down the costs. However, anchoring systems are ultimately designed for specific site conditions and further innovation for California federal wind leases are needed to reduce the risk of delays in deployment of floating offshore wind energy.

The project team will collect site specific conditions and evaluate the seismic hazards as they relate to the California offshore wind sites. Using this collected data and mooring load details from site specific analysis with team partners, the project team will design an anchoring system best suited for the sites using the Recipient's helical anchoring system. The design will be fabricated and tested in a centrifuge and then a California supply chain assessment will be performed.

The novel anchor design will solve the issues associated with soil type, water depth, seabed slope and seismic hazards while enabling a local supply chain and an environmentally friendly solution to the native habit.
The anchoring system will also be evaluated for its use with shared anchors (multiple mooring lines to one anchor) to enable other innovations across the value change. The goal is to develop an anchoring system that allows for a variety of technologies to enable cost reductions across the system design.

C. GOALS AND OBJECTIVES OF THE AGREEMENT

Agreement Goals
The goals of this Agreement are to:

1. Develop a cost-effective, high-uplift mooring capacity anchoring solution designed for the dynamic soils and seismic activity off the coast of California
2. Prove new offshore anchor technology capabilities with optimized seismic factor capacity correlation through industry accepted laboratory testing
3. Demonstrate potential benefits to the environment for the proposed anchoring design as compared to traditional anchor options
4. Develop a feasible path to manufacture anchors through local and regional workforces

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefit of lower costs by developing an anchoring system that can withstand the seismic hazards while being optimized for the site-specific geotechnical conditions that results in a lower weight system. Developing an anchoring system that is lower weight and able to be produced locally will enable a lower cost anchoring system to the offshore wind developer allowing lower costs to the ratepayer.

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 providing an optimized anchoring system to meet the challenging demands that the California offshore wind sites present to anchoring. The project will evaluate all the required factors; soil types, seabed habits, seismic hazards, and California supply chain. Designing an anchoring system that overcomes these barriers to entry will enable the State of California to meet its energy goals. Without a highly optimized anchoring system the overall costs of floating wind will continue to be too high to meet the energy goals.

[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).

Agreement Objectives

The objectives of this Agreement are to:

1. (a) Determine optimal anchor design for high uplift mooring conditions in dynamic soils
   (b) Develop a site-specific ground model of the geotechnical conditions and seismic loading effects
   (c) Reduce the manufacturing and installation costs compared to alternative anchor technologies.
2. (a) Quantify seismic effects on anchor system components
   (b) Create a soil-structure model to replicate California's soil conditions and validate testing methods
3. Evaluate anchor design options that can minimize impacts as much as practical to marine life during the installation and operation of the proposed anchor solution
4. Develop a commercial scale manufacturing plan for the Recipient's anchoring system with 100% California manufacturing

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations**.** All technical tasks should include product(s). Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version, including the Final Report Outline and Final Report

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.

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

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

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

  The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
  - Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
  - Text documents will be in MS Word file format, version 2007 or later.
  - Project management documents will be in Microsoft Project file format, version 2007 or later.

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.

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

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

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

  The technical portion of the meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Technical products (subtask 1.1);
  - Progress reports (subtask 1.5);
  - Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
  - Any other relevant topics.

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

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

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

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

CAM Product:
- Kick-off Meeting Agenda

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

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

The Recipient shall:
- Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2)

includes recommendations and conclusions regarding continued work on the project.
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

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

Recipient Products:
- CPR Report(s)

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

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

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

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.
  - The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
  - The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
    - Disposition of any procured equipment.
    - The CEC's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

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

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

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

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

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

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

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)

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

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

CAM Product:
- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

The Recipient shall:
- Prepare a *Match Funds Status Letter* that documents the match funds committed

to this Agreement. If no match funds were part of the proposal that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:

- A list of the match funds that identifies:
  - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
  - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
  - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.

- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Subtask 1.8 Permits

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

The Recipient shall:

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

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required 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)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

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

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

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

The Recipient shall:

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

Products:

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

Subtask 1.11 TAC Meetings

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

The Recipient shall:

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

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

The TAC shall:

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

Products:

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

Subtask 1.12 Project Performance Metrics

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

The Recipient shall:

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

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

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

IV. TECHNICAL TASKS

TASK 2 GEOTECHNICAL INVESTIGATION

The goal of this task is to perform an offshore geotechnical site investigation to create a representative ground model for anchor analysis. Site specific geotechnical data is crucial to determining the viability of the anchor design in accordance with the requirements in the grant opportunity.

The Recipient shall:
- Prepare a *Geotechnical Evaluation Summary* that includes but is not limited to:
    - Review of available geotechnical and geophysical data (e.g., BOEM, NOAA)
    - Geographical information system (GIS) Data
- Discuss with offshore wind developers and industry experts on planned turbine locations and spacing within the federal lease areas
- Create an *Offshore Geotechnical Investigation Plan* that includes but is not limited to an outline of:
    - The schedule and contractors associated with the offshore activity
    - The cone penetration test (CPT) locations within the federal WEAs
    - Data to be collected during the investigation
    - Potential permits required for the investigation (e.g. Army Corps of Engineers)
    - Equipment mobilization/demobilization
    - Quayside activities
    - Vessel and crew logistics and operations
    - Offshore deck handling and subsea operations
    - Vessel support activities
    - Required safety measures for minimization of impacts to marine life
- Schedule vessel and port support with broker and agent

- Obtain required permits and approvals
- Perform an offshore geotechnical site investigation
- Create a *Field Report* including the raw CPT data from the survey equipment and any future survey recommendations

Products:

- Geotechnical Evaluation Summary
- Offshore Geotechnical Investigation Plan
- Field Report

TASK 3 MARINE LIFE AND HABITAT ASSESSMENT

The goal of this task is to identify, evaluate, and map marine wildlife and habitats that are common on the California coast, especially in the offshore wind lease area where the CPT was conducted, to inform the anchor design that does not create environmental concerns.

The Recipient shall:

- Review available data that are most critical to analyzing the potential impacts related to offshore anchor installation and operations for floating offshore wind turbine platforms
- Prepare a draft *Biological Assessment* that includes but is not limited to:
    - An inventory and map of any sensitive biological resources on or within proximity to the federal lease sites
        - Plant and wildlife species listed as rare, threatened, endangered or as species of special concern, pursuant to federal and state regulations
        - Designated critical or sensitive habitat
        - Biologically important areas
        - Migratory patterns and corridors
    - Any biological constraints in reference to anchor installation or operation
    - Whether anchor installation or operations would result in potentially significant adverse impacts to biological resources

Products:

- Biological Assessment

TASK 4 LOCAL COMMUNITIES IMPACT

The goal of this task is to quantify the economic impacts to local communities, with a focus on low-income and disadvantaged communities, this anchoring technology, when commercialized, can provide.

The Recipient shall:

- Perform a workforce needs assessment for the anchor system, including, but not limited to:
    - Detail of the quantity and level of effort for roles required for anchor fabrication, manufacturing, transport, marshaling, and installation
    - Quantifying contract timelines, compensation, and costs related to employees and subcontractors located in California
    - Defining employee skills and experiences preferable for specific roles
- Identify communities and stakeholders in California, with a focus on low-income and disadvantaged communities, who could fulfill the workforce requirements for manufacturing and deployment of the anchor system. Utilize internal and external resources and organizations, including, but not limited to:
    - Disadvantaged Communities Map, California Environmental Protection Agency (CalEPA)
    - Environmental Justice Screening and Mapping Tool, CalEPA
    - California Climate Investments Priority Populations, California Air Resources Board
    - California Traditional Tribal Territories Map, California High Speed Rail (HSR)
    - Native-Land.ca, Native Land Digital
    - California Unions Roll Lists, California Labor Federation
    - Northern California Indian Development Council
- Create a *Workforce Needs and Stakeholder Engagement Plan* to ensure workforce needs are met, in line with development schedules, which includes:
    - Workforce Needs Assessment
    - Defining goals and designed outcomes
    - Planning activities and outreach
    - Establishing tracking processes

Products:

- Workforce Needs and Stakeholder Engagement Plan

TASK 5 CALIFORNIA SUPPLY CHAIN ASSESSMENT

The goal of this task is to establish a roadmap and network for delivering new efficient anchor systems to California FOW farms from regional manufacturers. The recipient will establish a three-phase approach that considers current California infrastructure and competencies along with its estimated potential and the desired level of fabrication capabilities to fulfil local content goals.

The Recipient shall:

- Develop *Phase I Anchor Procurement Roadmap Report*. This task will determine feasible procurement packages to deliver anchors to California based on current infrastructure and will include the following:
    - A list of general US and California fabrication suppliers and their competencies to understand existing and planned abilities and limitations.

- Develop *Phase II Anchor Procurement Roadmap Report*. This task will prioritize California and regional supply chain capabilities to procure anchor packages for west coast projects and will include the following activities:
    - Create an indicative package with anchor component drawings for potential suppliers to assess for fabrication capabilities.
    - Reach out to competent fabricators for their feedback on the anchor component supply package. Take note of their recommendation to design for manufacturing readiness. Highlight ability to deliver in the future based on existing capabilities and identify any fabrication gaps and the ability to close them.
    - Optimize anchor design to maximize current infrastructure capacities.
- Develop *Phase III Anchor Procurement Roadmap Report*. This task will focus on optimizing regional supply chain potential to the level required of planned FOW projects and will include the following activities:
    - Develop MOUs with suppliers that have existing capabilities and prepare a roadmap to build additional capacity to support future demand.
    - Assess California infrastructure and propose necessary improvements to move components and partially assembled anchors without reliance on traditional out-of-state methods.
    - Identify potential locations and ports for final anchor assembly, staging, and mobilization for deployment.

Products:

- Phase I Anchor Procurement Roadmap Report
- Phase II Anchor Procurement Roadmap Report
- Phase III Anchor Procurement Roadmap Report

TASK 6 SEISMOTECTONIC AND SITE CHARACTERIZATION

The goal of this task is to classify, quantify, and map extreme soil conditions for the California coast with respect to anchoring systems, especially at the CPT survey site. The recipient will focus this assessment on GIS layers, data, and documentation that are most critical to analyzing the potential harmful impacts from exposure to extreme weather events including earthquakes, tsunamis, and liquefaction. This task will be used to inform anchor design and centrifuge testing regime.

The Recipient shall:

- *Prepare a Site Geotechnical Data & Seismic Hazard Report* that includes but is not limited to:
    - Offshore geotechnical investigation overview
    - Raw data from CPT survey
    - Assumptions made while interpreting the CPT data
    - A summary of the following activities:
        - Generate a ground model and soil parameters to be used in design

        - Identify, evaluate, and map information on extreme weather conditions for the California coast related to seismic hazards with respect to anchoring systems
            - Include GIS layers and data
        - Data will be assembled from a wide range of resources including but not limited to the following geological resources:
            - Sediment and seafloor composition
            - Onshore and offshore slope characteristics
            - Earthquake faults
            - Seismic ground shaking and ground failure
- Prepare a *Seismotectonic and Site Characterization Report.* The activities to accomplish this goal that will be performed by the recipient in this task and summarized in the report include:
    - Develop effective ground acceleration time histories
    - Build a response spectrum depicting the maximum response to ground motion (shaking) and ground failures
    - Determine and classify near-field dynamic and cyclic activity and seismicity
- Prepare a *CPR Report* and participate in CPR meeting per subtask 1.3.

Products:
- Site Geotechnical Data and Seismic Hazard Report
- Seismotectonic and Site Characterization Report
- CPR Report

TASK 7 FLOATER MOORING ANALYSIS

The goals of this task are to develop anchor load cases based on site-specific mooring analyses for both semisubmersible platforms and tension leg platforms (TLP). Each mooring analysis will provide realistic, site-specific dynamic loading scenarios imposed on an anchor system for the recipient to use as anchor design criteria, such as line tension per angle of inclination, load frequency, and magnitude.

The Recipient shall:
- Develop a *Met Ocean and Design Basis Report* using the wind and wave conditions at the federal wind lease sites based on Bureau of Ocean Energy Management (BOEM) 2018-057 and industry guidelines including but not limited to the following:
    - Wind conditions
        - Include omni-directional and directional speed distribution and shear
        - Extreme wind conditions include extreme wind speed, shear, extreme turbulence model and extreme deterministic wind events
    - Marine conditions
        - Current speeds and directions for normal and extreme events

        - Water levels, significant wave heights, maximum wave heights, wave period and directions for normal and extreme conditions
    - Correlation of wind and wave statistics
    - Other metocean parameters, including:
        - Water density, water salinity, water temperatures
        - Wave breaking
    - International Codes and Standards search relevant to offshore wind, platforms, mooring, and anchoring
    - Metocean & site data review
    - Wind turbine generator data collection
    - Design criteria and methodology
    - Design load case matrix
- Perform a wind turbine generator modelling and scaling including the following factors:
    - Global geometry, mass and center of gravity
    - Aerodynamic properties scaling
    - Whole-building energy model
- Assess TLP floater sizing based on operating criteria, hull geometry, and OrcaFlex modeling
    - Detail TLP mooring system sizing based preliminary mooring layouts, mean and dynamic mooring load derivation, and preliminary sizing based on restoring curves
- Perform a detailed TLP motion-mooring analysis including ultimate and allowable limit states based on the following process:
    - Mooring load screening simulations
    - Fully dynamic simulation (6-seed)
    - Mooring configuration sensitivities
- Perform a TLP fatigue limit state mooring analysis based on the following process:
    - Design load case matrix refinement
    - Fully dynamic simulations
    - Simulation batch run with quasi-static mooring
    - Simulation post-processing and rain flow
- Develop interface requirements of mooring line and anchor
    - Investigate optimum distribution of anchors
    - Identify component requirements
    - Investigate installation methods
- Perform a risk assessment failure mode effect analysis that includes components and installation assessments
- Develop a *TLP and Shared Anchor Mooring Analysis Report* to include dynamic motion-mooring analyses of taut and tension leg anchoring systems and shared anchors. The report will include but not be limited to:
    - Platform specifications with respect to hydrodynamics and response amplitude operators (RAO)

    - Mooring line properties representative of the steel and synthetic systems to be deployed in deep water.
- Perform a mooring analysis of shared anchor solutions based on the following process:
    - Review results from National Offshore Wind Research & Development Consortium (NOWRDC) shared anchoring projects from Deep Reach Technology and the recipient
    - Initial optimization of the mooring spread including exact configurations, line sizes and lengths, pretension, and layouts
    - Review number of mooring lines per platform and mooring lines per anchor configurations
    - Platform specifications with respect to hydrodynamics and RAO
    - Mooring line properties representative of the steel and synthetic systems to be deployed in deep water.

Products:

- Met Ocean and Design Basis Report
- TLP and Shared Anchor Mooring Analysis Report

TASK 8 BASELINE ANCHOR DESIGN

The goal of this task is to design an anchor that meets the site-specific soil and mooring conditions based off initial engineering design equations. The anchor design will be reevaluated after testing to optimize the design based on findings with additional considerations for anchor design when needed.

The Recipient shall:

- Review ground models, soil strength data, and mooring analysis loading conditions from previous tasks
- Develop an *Initial Anchor Design Summary* including but not limited to:
    - Soil profile used for analysis and assumptions made
    - Mooring loads and application safety factors for anchors according to industry guidelines
    - Anchor design equations
    - Structural assessment
    - Local manufacturing feasibility assessment
- Prepare a draft *Anchor Design Report* which includes but is not limited to:
    - Initial anchor design
    - Relevant design changes based off test findings
    - Final anchor design
- Submit the draft *Anchor Design Report* to the Cam for feedback and incorporate changes as requested in the Final *Anchor Design Report*

Products:

- Initial Anchor Design Summary

- Anchor Design Report (draft and final)

TASK 9 CENTRIFUGE TESTING

The goal of this task is to perform a series of static and dynamic centrifuge tests on the anchor system using a site-specific soil profile, obtained during the site investigation, to assess the performance of the anchor system.

The Recipient shall:

- Prepare a draft *Centrifuge Test Plan* which includes but is not limited to:
  - Testing soil profile based on the soil profiles generated from the site investigation
  - Scale models of the initial anchor design
  - Testing protocol for each test run
  - Instrumentation and measurement devices
  - Detailed centrifuge testing schedule
  - Roles & responsibilities for each party including testing facility, recipient and subcontractors
  - Detailed goals and objectives of each test run
- Submit the draft *Centrifuge Test Plan* to the CAM for feedback and incorporate changes as requested in the final *Centrifuge Test Plan*
- Construct scale models of the anchor system including:
  - Skirt
  - Template
  - Helical pile shafts and helices
- Construct test beds with soil, anchor models, and instrumentation
- Perform testing protocol in centrifuge based on the *Centrifuge Test Plan*
- Prepare *Centrifuge Testing Report* which includes but is not limited to:
  - Instrumentation measurements
  - Overview of testing with pictures
  - Testing results
  - Recommendations for future testing

Products:

- Centrifuge Test Plan (draft and final)
- Centrifuge Testing Report

TASK 10 NUMERICAL ANALYSIS VALIDATION

The goal of this task is to use the results of the centrifuge testing program to validate numerical models which will be used to perform a parametric study investigating seismic effects on the anchor system.

The Recipient shall:

- Validate the numerical model using FLAC^{3D} software.

    - The mesh and structural elements will reflect the size of the testing tank and anchor elements, respectively, used in the centrifuge testing
    - The constitutive model will be determined after soil characterization and strength profiling
    - Static and dynamic analyses will be performed, mirroring the tests performed in the centrifuge
        - The acceleration-time history utilized for the centrifuge testing will be implemented in the dynamic analysis
        - The results of the centrifuge testing will be used to calibrate and validate the numerical models
- Prepare a *Numerical Modeling Report* which includes but is not limited to:
    - Model creation
    - Centrifuge and numerical modeling alignment
    - Recommendations on future numerical modeling
- Prepare a *Parametric Study Plan* to extrapolate results to commercial scale anchoring systems
    - Once the numerical model is validated, a parametric study will be performed to gain further understanding of seismic effects on the anchor system
    - Parameters will be determined at the time of the study and could include, but not be limited to:
        - Skirt diameter/length
        - Helical pile depth
        - Helical anchor spacing
        - Soil type
        - Acceleration-time history
- Submit a *Parametric Study Report* to detail out the findings results and conclusion of the study

Products:

- Numerical Modeling Report
- Parametric Study Plan
- Parametric Study Report

TASK 11 ANCHOR SOLUTION COMPARISON

The goal of this task is to demonstrate the benefits of the anchor as compared to other anchor technologies currently being considered for California FOW opportunities through an unbiased, third-party evaluation. Anchor system design for FOWT platforms in deep water will consider both catenary and taut anchoring systems.

The Recipient shall:

- Conduct a comparative desktop analysis of alternative anchoring design systems for FOWT platforms.

  - Identify and evaluate commercially available anchoring systems with respect to design criteria, costs, and local manufacturing and component sourcing feasibility.
  - Determine the potential environmental impacts related to the commercially available anchoring systems.
- Through third-party efforts, compose an *Anchor Comparison Report* comparing the Recipient's anchoring design to alternative anchoring design.
  - If required, develop a mitigation plan for any negative impacts where the Recipient's anchor design changes are not feasible.

Products:
- Anchor Comparison Report

TASK 12 EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:
- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes but is not limited to the following information:
  - Technology commercialization progress
  - New media and publications
  - Company growth
  - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website 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 13 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

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

The Recipient Shall:

- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the draft *Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Technology Transfer Plan. This document will identify:
    - TAC comments the recipient proposes to incorporate into the final *Technology Transfer Plan*.
    - TAC comments the recipient does not propose to incorporate with and explanation why.
- Submit the final *Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in final *Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC-sponsored conference/workshop(s) on the project.

- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of 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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.