California Energy Commission
November 12, 2025 Business Meeting
Backup Materials for Integral Consulting Inc.

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

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

[PROPOSED]

RESOLUTION NO: 25-1112-XX

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Integral Consulting Inc.

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

RESOLVED, that the CEC approves agreement EPC-25-037 with Integral Consulting Inc. for a $3,000,000 grant. The project will develop entanglement and environmental monitoring and mitigation technology associated with floating offshore wind projects. Technologies include entanglement prediction modeling, a risk assessment framework, and a system of uncrewed underwater and surface vehicles equipped with sonar and visible-light sensors to monitor, identify, and mitigate fishing gear and debris entangled within California's designated wind energy areas; 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 November 12, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kim Todd
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

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

New Agreement Number: EPC-25-037

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Katie Greenwald
3. MS-:None
4. Phone Number: 279-226-1147

C. Recipient's Information

1. Recipient's Legal Name: Integral Consulting Inc.
2. Federal ID Number: 48-1266683

D. Title of Project

Title of project: Development of an autonomous detection and mitigation framework for entanglements around offshore wind farms

E. Term and Amount

1. Start Date: 11/30/2025
2. End Date: 12/31/2029
3. Amount: $3,000,000.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 11/12/2025.
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Katie Greenwald
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: Electric Program Investment Charge (EPIC)

Agenda Item Subject and Description:

INTEGRAL CONSULTING INC. Proposed resolution approving agreement EPC-25-037 with Integral Consulting Inc. for a $3,000,000 grant, and adopting staff's recommendation that this action is exempt from CEQA. The project will develop entanglement and environmental monitoring and mitigation technology associated with floating offshore wind projects. Technologies include entanglement prediction modeling, a risk assessment framework, and a system of uncrewed vehicles equipped with sonar and visible-light sensors to monitor, identify, and mitigate discarded fishing gear and debris entangled within California's designated wind energy areas. (EPIC funding) Contact: Katie Greenwald

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. Awaiting Attorney exemption language.**

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:

CCR section number: CCR section number 1, CCR section number 2. Or, 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:

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

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

Cal. Code Regs., tit. 14, §15306 consists of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. This project will develop entanglement monitoring, detection, and mitigation technology using a system of uncrewed surface and underwater vehicles. The largest uncrewed vehicle, which hosts 3 smaller ones, is 9m long and 2.5m wide. The vehicles will be in the water for 30 days at a time to collect data in order to develop algorithms capable of detecting and mitigating entanglements and environmental and structural health monitoring. The State Lands Commission determined that such surveys are exempt as information gathering. (2 CCR 2905(e)(3).) This project will cause minimal or no disturbance to the land and does not have the potential to cause serious or major disturbances to an environmental resource. This project will not have a significant effect on the environment therefore it is exempt under California Code of Regulations, title 14, section 15306.

The project does not involve impacts on any particularly sensitive environment; will not impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies; does not involve any cumulative impacts of successive projects of the same type in the same place that might be considered significant;

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

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

No

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

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

H. Is this project considered "Infrastructure"?

No

I. Subcontractors

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

Subcontractor Legal Company Name	CEC Funds	Match Funds
Triple HS, Inc. DBA H.T. Harvey & Associates	$ 249,899	$49,955
Ulysses Ecosystem Engineering Inc.	$ 1,984,500	$400,000
The Regents of the University of California, on behalf of the San Diego Campus' - Scripps Institute of Oceanography	$ 97,755	$27,097

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

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

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
Amazon.com, Inc.	**$3,918**	**$0**
Microsoft Azure	**$10,000**	**$0**
Ocean Sonics Ltd	**$15,000**	**$0**
Ulysses Ecosystem Engineering Inc.	**$0**	**$250,000**
Heshel Machine Co. LLC	**$180,000**	**$0**
McMaster Carr	**$250,000**	**$0**
Teledyne Technologies Incorporated	**$160,000**	**$0**
Figureida Designs	**$15,000**	**$0**
Amazon Web Services, Inc.	**$40,000**	**$0**

K. Key Partners

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

Key Partner Legal Company Name
No key partners to report

L. Budget Information

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

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	23-24	301.001K	$ 3,000,000

TOTAL Amount: $ 3,000,000

R&D Program Area: ESB: Renewables

Explanation for "Other" selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Craig Jones

Address: 200 Washington St Ste 201

City, State, Zip: Santa Cruz, CA 95060-4976

Phone: 831-466- 9630 x872

E-Mail: cjones@integral-corp.com

2. Recipient's Project Manager

Name: Kaustubha Raghukumar

Address: 200 Washington St Ste 201

City, State, Zip: Santa Cruz, CA 95060-4976

Phone: 831-576-2876

E-Mail: kraghukumar@integral-corp.com

N. Selection Process Used

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

Selection Process	Additional Information
Competitive Solicitation #	GFO-24-307
First Come First Served Solicitation #	Not applicable
Other	Not applicable

O. Attached Items

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

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
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: Katherine Greenwald

Approval Date: 9/29/2025

Branch Manager: Kevin Uy

Approval Date: 10/1/2025

Director: Jonah Steinbuck *(delegated to Branch Manager)*

Approval Date: n/a

Exhibit A
Scope of Work
Integral Consulting Inc.

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Identification of Test Site(S), Data Gaps and Sensor Needs
3	X	Sensor Integration and Testing
4		Data Analysis and Machine Learning Algorithm Development
5	X	Debris Tracking and Risk Assessment
6		Mitigation, and Environmental and Structural Health Monitoring
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
ALDFG	Abandoned, Lost, or Otherwise Discarded Fishing Gear
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
CPUC	California Public Utilities Commission
CTD	Conductivity-Temperature-Depth
EPIC	Electric Program Investment Charge
FOSW	Floating Offshore Wind
LCOE	Levelized Cost of Energy
ML	Machine Learning
NGO	Non-Governmental Organization
SHM	Structural Health Monitoring
SQL	Structured Query Language
TAC	Technical Advisory Committee
UUV	Uncrewed Underwater Vehicle
USV	Uncrewed Surface Vehicle
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.

Exhibit A
Scope of Work
Integral Consulting Inc.

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development of an entanglement monitoring, detection, and mitigation technology that consists of an ocean model-based particle tracking system and entanglement risk assessment framework. The proposed system will minimize costs and processing time for detection, identification, and characterization of abandoned, lost, or otherwise discarded fishing gear (ALDFG) and other marine debris entanglements in floating offshore wind (FOSW) mooring lines and inter-array cables.

B. Problem/ Solution Statement

Problem

Regulatory uncertainty and the potential for delays to planning, permitting, and construction persists in the deployment of FOSW in California. Innovation is required in the scientific and technological assessment of debris entanglement in mooring lines and inter-array cables. Understanding entanglement risk would also reduce operational restrictions and subsequent deterioration of project economics for the first generation of FOSW projects in California. Both the Humboldt and Morro Bay wind energy areas (WEAs) are home to a rich array of marine wildlife, some of which may be more vulnerable to entanglement on account of their behaviors and sensory modalities, and the fact that their movements and habitats overlap with the WEAs. Reducing the risk of entanglement requires that entangled debris and gear are quickly identified and removed from FOSW infrastructure. However, the California WEAs are extensive and remote, complicating the task of monitoring for entanglements throughout the FOSW installations.

Solution

The Recipient will leverage an integrated system consisting of uncrewed surface and underwater vehicles (USVs and UUVs) equipped with monitoring technologies, tactile implements, and onboard machine learning (ML)based processing for detecting, identifying, and removing entanglements, as well as environmental monitoring and structural health monitoring (SHM). The USV will serve as a “mothership” to the UUVs, supporting continuous deployment, retrieval, and recharging and data transfer for up to three UUVs, allowing for extended missions without the need for human intervention. The Recipient will utilize an ocean model-based particle tracking system and entanglement risk assessment framework to increase understanding in three key areas: (1) the three-dimensional spatial and temporal distribution and behavior of ALDFG and other marine debris , (2) periods of high probability of debris entering the WEAs, and (3) critical “high risk” periods when marine mammal species that could entangle are more likely to be in the area (i.e., during seasonal migrations, feeding seasons, etc.). Model-determined “high risk” periods and locations will inform timely and efficient UUV missions. Minimizing the risk of entanglement will be critical for approval of FOSW permits and to ensure that California’s transition to a zero-carbon electric system is conducted in an environmentally responsible manner.

C. Goals and Objectives of the Agreement

Exhibit A
Scope of Work
Integral Consulting Inc.

Agreement Goals

The goal of this Agreement is to develop entanglement and environmental monitoring and mitigation technology that consists of an entanglement prediction model, a risk assessment framework, and a system of integrated USV and UUVs equipped with acoustic (sonar) and visible-light sensors to monitor and quickly and efficiently identify and mitigate entangled ALDFG and debris within California WEAs.

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefit of lower costs by minimizing risks to wildlife and therefore, derisking sites prior to offtake. For example, on the U.S. East coast, investment in pre-development activities such as improved environmental characterization were identified as having the potential to reduce developer risk, resulting in reductions in developer uncertainty and a benefit of an estimated $530M over 25 years.[3] Preliminary cost estimates for FOSW environmental monitoring are 0.3–0.5% of levelized cost of energy (LCOE). While current projections of FOSW developments in the U.S. estimate that development and permitting account for about 1–2% of the LCOE of a project, the timeline impacts of permit negotiations, delays, and litigation have an outsized impact on an individual project's economic viability that is not examined by those projections. With respect to wildlife, improving the ability to predict potential effects with a data-driven risk assessment framework enhances the prioritization and evaluation of mitigation and monitoring needs. This, in turn, helps reduce costs to developers and ratepayers by enabling targeted mitigation and practical data collection and analysis strategies that support meaningful adaptive management based on actual baseline conditions.

Technological Advancement and Breakthroughs:[4] 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 increasing understanding of potential interactions between marine mammals and FOSW technologies. The resulting development of technology to identify entanglements around FOSW and characterize entanglement risk will benefit California State and federal governments, stakeholders, and developers making decisions for FOSW projects by providing a means to derisk projects prior to approval, and mitigating risks once operational. Persistent and autonomous sensing will help define policies, facilitate permitting, evaluate turbine siting and arrays, inform construction and operations, understand trade-offs, identify data gaps and prioritize research, and expedite device deployment, the results of which will be increased renewable energy generation in California and further diversification of the State's clean energy portfolio. Non-governmental organizations (NGOs) can use information from the developed technology to consider strategies to support sustainable approaches to FOSW development and inform engagement with developers and stakeholders. Agencies, researchers, and NGOs can also use outcomes to evaluate data gaps and prioritize research to address

---

[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 (CPUC), 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).

[3] McClellan Press, K. and G. Lampman. 2019. New York's Predevelopment Activities Advance Offshore Wind. North American Clean Energy. 40–41.

[4] California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

areas of risk. In complex, dynamic systems that are logistically difficult and expensive to study, data gaps will require an assessment of risk and application of well-considered mitigation and monitoring to inform adaptive management.

Agreement Objectives

The objectives of this Agreement are to:

- Identify California WEA entanglement risk data gaps and needs to assess monitoring sensors, entanglement mitigation approaches, and debris removal options.
- Integrate sonar and visible-light imaging systems and environmental monitoring technologies with an advanced, modular UUV such that (i) power to sensors is supplied by the UUV and (ii) sensor data streams into the UUVs onboard processing system that includes a ML-based entanglement detection pipeline.
- Develop a comprehensive ML framework for underwater object detection that can quickly process, analyze, and interpret multimodal sensor input with ML accuracy above 85%.
- Develop a system that can adequately predict the presence of ALDFG and marine debris within the California WEAs and isolate hot spots where debris are more likely to accumulate and potentially become entangled.
- Identify an appropriate electromechanical cutter, integrate the cutter onto the UUV, and test and validate its capability for severing 25 mm polypropylene rope in less than 15 s.
- Evaluate the developed system of technologies for environmental monitoring and SHM, including but not limited to 90% call detection probability within 1 km for passive acoustic monitoring and multibeam sonar imaging at 120° swath, 2-cm resolution at 30 m, and onboard machine learning (ML) to detect entanglements and FOSW structural deficiencies.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

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

The Recipient shall:

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

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on

the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.

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

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

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

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

- **Software Application Development**
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open-source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.

- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., Teams, Zoom), with approval of the CAM.

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5);
  - Quarterly Progress reports (subtask 1.6);
  - Final Report (subtask 1.7);
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards (subtask 1.10);
  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; and
  - Any other relevant topics.

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

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

The CAM shall:

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

Recipient Products:

- Kick-off Meeting Presentation
- Updated Project Schedule *(if applicable)*
- Match Funds Status Letter (subtask 1.8) *(if applicable)*
- Permit Status Letter (subtask 1.9) *(if applicable)*

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

The Recipient shall:

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

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda may include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a schedule for providing a Progress Determination on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. A determination of unsatisfactory progress This may result in project delays, including a

potential Stop Work Order, while the CEC determines whether the project should continue.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:
- CPR Report(s)

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

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

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

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

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

MONTHLY CALLS, REPORTS AND INVOICES

Subtask 1.5 Monthly Calls

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

The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted, or the CAM determines that a monthly call is unnecessary.

The CAM shall:

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

The Recipient shall:

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

Product:

- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly Progress Reports and Invoices

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

The Recipient shall:

- Submit a *Quarterly Progress Report* to the CAM. Each progress report must:
  - Summarize progress made on all Agreement activities as specified in the scope of work for the reporting period, including accomplishments, problems, milestones, products, schedule, fiscal status, and an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: https://www.energy.ca.gov/media/4691
- Submit a monthly or quarterly *Invoice* on the invoice template(s) provided by the CAM.

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:

- Invoice template

Subtask 1.7 Final Report
The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.7.1 Final Report Outline

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

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

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

Subtask 1.7.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (**I**f more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does propose to incorporate and an explanation for why.

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

Products:

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

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBAWARDS

Subtask 1.8 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

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

  If match funds were a part of the application that led to the CEC awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.

    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

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

Subtask 1.9 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

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

Products:

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

Subtask 1.10 Obtain and Execute Subawards and Agreements with Site Hosts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 Technical Advisory Committee (TAC)

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

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

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.12.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.

- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

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

Subtask 1.12 TAC Meetings
The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

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

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

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

Subtask 1.13 Project Performance Metrics
The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

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

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

*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: IDENTIFICATION OF TEST SITE(S), DATA GAPS AND SENSOR NEEDS

The goals of this task are to identify a suitable WEA (e.g., Morro Bay or Humboldt) where the developed technology will be demonstrated, identify available data resources related to the identified site, and compile data gaps to enable efficient and targeted technology development.

The Recipient shall:

- Conduct a literature review on entanglement risks as they relate to the FOSW industry and the California Current ecosystem.
- Identify a suitable WEA and lease areas within the WEA (e.g., RWE in the Humboldt Bay WEA, Equinor in the Morro Bay WEA) where project efforts can be demonstrated.
- Identify data needs and gaps specific to the identified WEA that need to be addressed to further advance project goals including but not limited to:

  - Dimensions and layouts of proposed FOSW structures;
  - Fishing seasons and types of fishing gear used in or near the WEA;
  - Surface and subsurface currents in the region;
  - Marine mammal distributions in the WEA.
- Review and identify sensor suites that are suitable to find and mitigate entanglements (including power budget and data throughput, cost, and feasibility). Examples include:
  - Forward-looking multibeam echosounders;
  - Visible-light cameras;
  - Hydrophone packages;
  - Conductivity-temperature-depth (CTD) sensor.
- Prepare a *Data and Sensors Report* that describes available data, gaps in data, and sensor specifications required to meet the project goals.

Products:

- Data and Sensors Report

TASK 3: SENSOR INTEGRATION AND TESTING

The goals of this task are to integrate identified monitoring sensors onto the UUV and test and validate the UUV system functionality.

The Recipient shall:

- Procure the sensors identified in Task 2.
- Identify suitable mounting locations on the body of the UUV.
- Prepare a *Sensor Integration Testing and Verification Plan* that describes, but is not limited to:
  - Integrated UUV and monitoring sensor testing procedures (e.g., laboratory—bench and tank—and in-water tests);
  - Integrated USV-UUV testing procedures including power and data transfer and docking/launch and recovery between the UUV and its mothership USV;
  - Critical metrics being validated (e.g., power and data);
  - Measurement tools for verification.
- Physically and electronically (power and data throughput) integrate monitoring sensors with the UUV.
- Facilitate the electronic data transfer of sensor data gathered by the UUV into the USV. Verify and document correct operation during laboratory bench and tank tests.
- Conduct nearshore testing (<30 m depth) with surrogate infrastructure (e.g., metocean buoy moorings or pier pilings) or surrogate recoverable entanglements, or both.
- Conduct offshore testing, including two tests in a California WEA, to verify ability of monitoring sensors to image in deeper waters and to verify UUV performance and USV endurance.
- Evaluate and validate field data to determine optimal use modes for the California offshore environment and potential entanglement issues relevant to the California WEAs.
- Prepare a draft *Sensor Integration Test Report* that describes, at a minimum:
  - Laboratory and field data collection activities (including location, date/time, environmental conditions, surrogate infrastructure and marine debris);
  - End-of-project optimal/target USV–UUV use modes determined from field data collection activities;

  - Advantages and limitations of system data for FOSW entanglement monitoring;
  - Methodologies and testing to ensure operational durability in the California WEAs and long-term deployment.
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings) and participate in a CPR meeting, per subtask 1.3.

Products:

- Sensor Integration Testing and Verification Plan
- Sensor Integration Test Report (draft and final)
- CPR Report #1

TASK 4: DATA ANALYSIS AND MACHINE LEARNING ALGORITHM DEVELOPMENT

The goal of this task is to develop the ML processing framework that will analyze sensor data to detect and classify entanglements.

The Recipient shall:

- Develop automated quality assessment/quality control methods for monitoring sensor data, such as those from a multibeam echosounder and visible-light camera.
- Analyze and tag field data (images) of surrogate entanglements collected as part of Task 3. Develop and implement a ML framework to automatically detect and classify entanglements using field data collected as part of Task 3. The framework could involve but is not limited to:
  - Temporal and spatial synchronization of data from multiple sensing systems;
  - Feature extraction using, e.g., convolutional neural networks;
  - Sensor fusion to integrate information from multiple sensor modalities;
  - Object detection;
  - ML training and testing;
  - Data validation.
- Implement the ML algorithm onboard the UUV processor to enable on-the-fly automated object detection.
- Prepare a *Data Analysis Report* that describes technical specifications for collection and synchronization of multiple real-time sensor data sources in support of monitoring entanglements with FOSW technologies, including but not limited to:
  - Optimal use modes of each sensor (e.g., acoustic and visible-light cameras) as an integrated system;
  - Data flow;
  - Data processing and analysis methods, including any limitations;
  - How the data will be delivered to shore and used.

Products

- Data Analysis Report (draft and final)

TASK 5: DEBRIS TRACKING AND RISK ASSESSMENT FRAMEWORK

The goal of this task is to develop an ocean model-based particle tracking system and risk assessment framework that will reduce time and increase efficiency of UUV detection and classification of entanglements.

Exhibit A
Scope of Work
Integral Consulting Inc.

The Recipient shall:

- Conduct a literature review on what is known about marine debris in California as well as events that could lead to increased input of lost fishing gear and other debris to inform the risk framework.
- Conduct a literature review on what is known about the migration and occupancy patterns of marine organisms in the California WEAs at-risk of being entangled to inform the risk framework.
- Perform surveys of marine debris along coastal California and collect information from publicly available data sources (e.g., vessel monitoring system) to develop a matrix of characteristics of ALDFG.
- Use site-specific knowledge of fishing seasons and locations, along with collected samples of marine debris (e.g., ALDFG) to inform seeding the ocean particle models.
- Evaluate suitable operational ocean particle tracking models for ALDFG characteristics determined from ALDFG beach surveys.[5, 6, 7]
- Validate ocean model predictions using existing California Current drifter data.
- Create a model for gear strain and breakage and tune the probability of breakage from local estimates of ALDFG and publicly available wave and current data sources.
- Convolve estimates for spatial patterns of deployed gear with the strain/breakage model and historical wave and current estimates to determine spatial/temporal patterns of ALDFG.
- Apply the selected ocean particle tracking model to transport ALDFG forward and determine its potential interaction with FOSW moorings and inter-array cables.
- Use Monte-Carlo methods to repeat this workflow many times to determine robust estimates of where in the WEAs ALDFG is likely to entangle on FOSW moorings.
- Determine the monitoring procedure and framework for the USV–UUV-based entanglement detection system based on the projected spatial and temporal scales of entanglements predicted by the model and literature search.
- Prepare a draft *Debris Tracking and Risk Assessment Report* that describes, at a minimum:
    - Characteristics of ALDFG (e.g., size, material, spatial/temporal patterns) expected to occur in California WEAs determined from beach surveys and literature review and potential effects on marine mammals
    - The particle tracking model, including model domain, inputs, resolution, validation criteria, and validation results
    - ALDFG particle tracking results for a minimum of two model runs, where, e.g., one run is conducted during winter storm season and a second run is performed for a more quiescent summer period

[5] Beegle-Krause, J. 2001. General NOAA oil modeling environment (GNOME): a new spill trajectory model. International Oil Spill Conference. Vol. 2001. No. 2. American Petroleum Institute.

[6] Esser, Elizabeth A., James M. Pringle, and James E. Byers. 2023. Neither larval duration nor dispersal distance predict spatial genetic diversity in planktonic dispersing species. Marine Ecology Progress Series. 721, 161–167.

[7] Kaandorp, Mikael LA, et al. 2023. Global mass of buoyant marine plastics dominated by large long-lived debris. *Nature Geoscience* 16.8:689–694.

- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings) and participate in a CPR meeting, per subtask 1.3.

Products:

- Debris Tracking and Risk Assessment Report (draft and final)
- CPR Report #2

TASK 6: MITIGATION, ENVIRONMENTAL AND STRUCTURAL HEALTH MONITORING

The goals of this task are to develop and investigate a system for mitigation of entanglements, develop additional environmental monitoring capabilities, and create a framework for structural health monitoring around FOSW infrastructure.

The Recipient shall:

- Investigate the types of robotic arms and electromagnetic cutter(s) needed for the UUV to remove entangled debris identified in Task 5.
- Define additional hardware and software needs to achieve entanglement mitigation.
- Define system specifications for a docking station such as the mothership USV where retrieved entanglements can be stored.
- Prepare a *Mitigation Strategies Report* that describes, at a minimum:
    - Appropriate electromagnetic cutter(s) specifications;
    - Results of laboratory tests of the selected cutter for mitigating entanglement, e.g., using UUV tactile implements and cutter to sever a polypropylene line.
    - A framework for an entanglement mitigation UUV mission involving navigating to a location of detected and correctly classified entanglement and cutting/grabbing the entangled gear to bring to the surface for storage and retrieval;
- Enhance environmental monitoring capabilities of the UUV by implementing automatic marine mammal detectors for hydrophone data.
- Identify the types of structural deficiencies that can be imaged and identified by the UUV imaging sensors.
- Prepare an *Environmental and Structural Health Monitoring Report* that describes, at a minimum:
    - Environmental measurements of passive acoustics, including implementation of automated marine mammal detectors onboard the UUV;
    - Integration of CTD data with onboard processors to provide data for ocean model assimilation;
    - Framework for SHM using UUV imagers to automatically detect structural deficiencies (e.g., cracks and corrosion) in mooring lines and the subsurface structure of FOSW platforms;

Products:

- Mitigation Strategies Report
- Environmental and Structural Health Monitoring Report

TASK 7: EVALUATION OF PROJECT BENEFITS

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

Exhibit A
Scope of Work
Integral Consulting Inc.

The Recipient shall:

- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes but is not limited to the following information:
  - Technology commercialization progress
  - New media and publications
  - Company growth
  - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

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

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

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

The Recipient Shall:

- Develop and submit a *Technology Transfer Plan* that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.

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