

**CONTRACT REQUESTS FORM (CRF)**

CEC-94 (Revised 5/11)

CALIFORNIA ENERGY COMMISSION


 New Contract \_\_\_\_\_  Amendment to Existing Contract: \_\_\_\_\_ Amendment Number: \_\_\_\_\_

Division	Contract Manager:	MS-	Phone	CM Training Date
Energy Research and Development	Joe O`Hagan	43	916-327-1368	11/14/2007

Contractor's Legal Name	Federal ID Number
The Regents of the University of California on behalf of the California Institute for Energy and Environment	94-3067788

Title of Project
Exploratory Studies of Potential Environmental Issues with Alternative Energy Futures for California

Term	Start Date	End Date	Amount
New/Original Contract	6/29/2012	3/31/2015	\$ 1,193,197

Line up the Amendment information as best as possible within the following table.

Amendment #	End Date (mm/dd/yy)	Amount

### Business Meeting Information

Proposed Business Meeting Date	6/13/2012	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Joe O`Hagan	Time Needed:	5 minutes

**Agenda Item Subject and Description** This agenda item should be sent to the Research List Serve (Energy RD&D/PIER program).

Possible approval of Contract 500-11-033 for \$1,193,197 with the Regents of the University of California on behalf of the California Institute for Energy and the Environment (CIEE). The purpose of the agreement is to initiate an investigation of the envir

**Business Meeting approval is not required for the following types of contracts:** *Executive Director's signature is required in all cases.*

- Contracts less than \$10k (*Policy Committee's signature is also required*)
- Amendment for a no-cost time extension. Must be first extension, less than one year and original contract less than \$100k.
- Contracts less than \$25k for Expert Witness in Energy Facility licensing cases and amendments.

### Purpose of Contract or Purpose of Amendment, if applicable

The purpose of the Contract is to identify the potential environmental footprint of California's electricity system under different scenarios as the state strives to achieve its renewable energy and greenhouse gas emission goals. The project also involves studies of innovative tools and methodologies to improve the assessment, monitoring and mitigation of the environmental effects of future energy development.

### California Environmental Quality Act (CEQA) Compliance

- Is Contract considered a "Project" under CEQA?
  - Yes: skip to question 2
  - No: complete the following (PRC 21065 and 14 CCR 15378):

Explain why contract is not considered a "Project":
- If contract is considered a "Project" under CEQA:
  - a) Contract **IS** exempt. (Draft NOE required)
    - Statutory Exemption. List PRC and/or CCR section number: \_\_\_\_\_
    - Categorical Exemption. List CCR section number: 14 CCR 15306
    - Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why contract is exempt under the above section:  
The contract involves modeling and data collection efforts that do not have the potential to cause a significant impact on the environment.
  - b) Contract **IS NOT** exempt. The Contract Manager needs to consult with the Energy Commission attorney assigned to their division and the Siting Office regarding a possible Initial Study.

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CALIFORNIA ENERGY COMMISSION



Budgets Information								
Contract Amount Funded		Breakdown by FY			Funding Sources			
Funding Source	Amount	FY	Amount	Approved?	Funding Source	FY	Budget List No.	Amount
ARFVTF	\$	11-12	\$1,193,197	Yes	PIER-E	10-11	501.027I	\$100,000
ECAA	\$		\$		PIER-E	11-12	501.027J	\$1,093,197
State- ERPA	\$		\$					\$
Federal	\$		\$					\$
PIER - E	\$1,193,197		\$					\$
PIER - NG	\$		\$					\$
Reimbursement	\$		\$					\$
Other	\$		\$					\$
<b>TOTAL:</b>	<b>\$1,193,197</b>	<b>TOTAL:</b>	<b>\$1,193,197</b>		<b>TOTAL:</b>			<b>\$1,193,197</b>
Reimbursement Contract #:					Federal Agreement			

Contractor's Administrator/ Officer		Contractor's Project Manager	
Name:	Jyl Baldwin	Name:	Carl Blumstein
Address:	2150 SHATTUCK AVE	Address:	2087 ADDISON ST FL 2
City, State, Zip:	BERKELEY, CA 94704-1345	City, State, Zip:	BERKELEY, CA 94704-1268
Phone/ Fax:	510-642-8110 / 510-642-8236	Phone/ Fax:	510-643-9321 / 510-643-9324
E-Mail:	jbaldwin@berkeley.edu	E-Mail:	carl.blumstein@uc-ciee.org

Contractor Is
<input type="checkbox"/> Private Company (including non-profits) <input checked="" type="checkbox"/> CA State Agency (including UC and CSU) <input type="checkbox"/> Government Entity (i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state)

Selection Process Used
<input type="checkbox"/> Solicitation <u>Select Type</u> Solicitation #: _____ # of Bids: _____ Low Bid? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Non Competitive Bid (Attach CEC 96) <input checked="" type="checkbox"/> Exempt Interagency

Civil Service Considerations
<input checked="" type="checkbox"/> Not Applicable (Contract is with a CA State Entity or a membership/co-sponsorship) <input type="checkbox"/> Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER) <input type="checkbox"/> The Services Contracted: <input type="checkbox"/> are not available within civil service <input type="checkbox"/> cannot be performed satisfactorily by civil service employees <input type="checkbox"/> are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system. <input type="checkbox"/> The Services are of such an: <input type="checkbox"/> urgent <input type="checkbox"/> temporary, or <input type="checkbox"/> occasional nature that the delay to implement under civil service would frustrate their very purpose. <b>Justification:</b> Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)

**CONTRACT REQUESTS FORM (CRF)**



Payment Method			
<input checked="" type="checkbox"/> A. Reimbursement in arrears based on:			
<input type="checkbox"/> Itemized Monthly	<input checked="" type="checkbox"/> Itemized Quarterly	<input type="checkbox"/> Flat Rate	<input type="checkbox"/> One-time
<input type="checkbox"/> B. Advanced Payment			
<input type="checkbox"/> C. Other, explain:			

Retention			
1. Is contract subject to retention?		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
If Yes, Do you plan to release retention prior to contract termination?		<input type="checkbox"/> No	<input type="checkbox"/> Yes

Justification of Rates
The rates charged in this contract by the University of California are U.C. published rates and the overhead rates are the negotiated rates with the Energy Commission.

Disabled Veteran Business Enterprise Program (DVBE)
1. <input checked="" type="checkbox"/> Not Applicable
2. <input type="checkbox"/> Meets DVBE Requirements      DVBE Amount:\$ _____ DVBE %: _____
<input type="checkbox"/> Contractor is Certified DVBE
<input type="checkbox"/> Contractor is Subcontracting with a DVBE: _____
3. <input type="checkbox"/> Requesting DVBE Exemption (attach CEC 95)

Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE?		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
If yes, check appropriate box:		<input type="checkbox"/> SB	<input type="checkbox"/> MB <input type="checkbox"/> DVBE

Is Contractor subcontracting any services?		<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
If yes, give company name and identify if they are a Small Business (SB), Micro Business (MB) and/or DVBE:			
San Jose State University	<input checked="" type="checkbox"/> No	<input type="checkbox"/> SB	<input type="checkbox"/> MB <input type="checkbox"/> DVBE
San Diego State University	<input checked="" type="checkbox"/> No	<input type="checkbox"/> SB	<input type="checkbox"/> MB <input type="checkbox"/> DVBE
University of Oklahoma	<input checked="" type="checkbox"/> No	<input type="checkbox"/> SB	<input type="checkbox"/> MB <input type="checkbox"/> DVBE

Miscellaneous Contract Information			
1. Will there be Work Authorizations?		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
2. Is the Contractor providing confidential information?		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
3. Is the contractor going to purchase equipment?		<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
4. Check frequency of progress reports			
<input type="checkbox"/> Monthly		<input checked="" type="checkbox"/> Quarterly	<input type="checkbox"/> _____
5. Will a final report be required?		<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
6. Is the contract, with amendments, longer than a year? If yes, why?		<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
The Department of General Services has agreed to give the Commission blanket authority to execute multi-year contracts to support the Commission's RD&D Programs.			

# CONTRACT REQUESTS FORM (CRF)



The following items should be attached to this CRF			
1. Scope of Work, Attach as Exhibit A.	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached	
2. Budget Detail, Attach as Exhibit B.	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached	
3. CEC 96, NCB Request	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached	
4. CEC 30, Survey of Prior Work	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached	
5. CEC 95, DVBE Exemption Request	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached	
6. Draft CEQA Notice of Exemption (NOE)	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached	
7. Resumes	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached	
8. CEC 105, Questionnaire for Identifying Conflicts		<input checked="" type="checkbox"/> Attached	

\_\_\_\_\_  
 Contract Manager                      Date                      Office Manager                      Date                      Deputy Director                      Date

The following signatures are only required when contract approval is delegated to the Executive Office and not approved at a Business Meeting.  
 See Business Meeting Information Section.

\_\_\_\_\_  
 Presiding Policy Committee                      Date                      Associate Policy Committee                      Date                      Executive Director                      Date

## Exhibit A SCOPE OF WORK

### TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2		Development of Innovative Tools to Use Weather Data to Assess and Monitor Impacts of Existing and Future Energy Facilities on Aerial Faunas in California
3		Assessment of Offshore Wind Development Impacts on Marine Ecosystems
4		Evaluation of a Passive Acoustic Monitoring Network for the Harbor Porpoise in California
5		Development of an Environmental Impact Assessment Tool for Wave Energy Conversion
6		Assessment of the Potential Environmental Impacts of Alternative Energy Scenarios for California
7		Measurement of the Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation
8		Development of a Modeling Tool to Assess and Mitigate the Effects of Small Hydropower on Stream Fishes in Changing California Climate

### KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Carl Blumstein, The Regents of the University of California		
2	Winifred Frick, The Regents of the University of California		
3	Alex Hall, The Regents of the University of California		
4	Carl Blumstein, The Regents of the University of California	San Jose State University	
5	Carl Blumstein, The Regents of the University of California	San Diego State University	
6	Dan Kammen, The Regents of the University of California		
7	Michael Allen, The Regents of the University of California		
8	Lisa Thompson, The Regents of the University of California		

## Exhibit A SCOPE OF WORK

### GLOSSARY

*Specific terms and acronyms used throughout this work statement are defined as follows:*

<b>Acronym</b>	<b>Definition</b>
$\delta^{13}\text{C}$	The ratio of stable isotopes $^{13}\text{C}$ : $^{12}\text{C}$ reported in parts per million
$\delta^{18}\text{O}$	The ratio of stable isotopes $^{18}\text{O}$ : $^{16}\text{O}$ reported in parts per million
$^{12}\text{C}$	Carbon 12
$^{13}\text{C}$	Carbon 13
$^{16}\text{O}$	Oxygen 16
$^{18}\text{O}$	Oxygen 18
$\text{CaCO}_3$	Calcium Carbonate, or Caliche
$\text{CO}_2$	Carbon Dioxide
C-POD	Autonomous Porpoise Click Detector
CPR	Critical Project Review
DELFT 3D	DELFT 3D (Three Dimensional) Wave Simulation Tool
DNA	Deoxyribonucleic Acid
EC	Eddy Covariance
Energy Commission	California Energy Commission
$\text{H}_2\text{O}$	Water
MRE	Marine Renewable Energy
NEXRAD	NEXt Generation RADar
PAC	Project Advisory Committee
PIER	Public Interest Energy Research
ROMS	Regional Oceanic Modeling System
SWAN	Simulated Waves Nearshore
SWITCH	Solar, Wind, Hydro and Conventional Generation and Transmission Investment Model
UCC.1	Uniform Commercial Code (Financing Statement)
WEAP	Water Evaluation and Planning
WEC	Wave Energy Conversion
WRF	Weather Research and Forecasting Model

# **Exhibit A**

## **SCOPE OF WORK**

### **Problem Statement**

California's electricity system will change drastically over the next few decades in response to the state's mandate to increase the contribution of renewable energy sources to the electricity mix while meeting state greenhouse gas emission reduction goals. Although California's electricity system is already being significantly transformed by the increasing contribution of solar and wind energy development, even greater penetration of these and other renewable energy technologies in the electricity system will be needed to meet California's energy and greenhouse gas goals. This will require both the energy development in areas beyond the reach of existing energy development and the deployment of emerging renewable energy technologies, which may raise unique environmental challenges.

A major challenge to the deployment of renewable energy in California has been a lack of background environmental data needed to better estimate potential impacts and design sound mitigation measures, e.g., solar generation in sensitive desert habitats. In the future, it is likely that today's emerging clean energy technologies will play a major role in the state's future energy system and that renewable energy development will occur in areas not historically used for energy generation. Therefore, it is important that environmental information relating to future renewable energy deployment be initiated so that decision-makers can select or influence energy development following one of the most environmentally benign paths.

### **Goals of the Agreement**

The goals of the Agreement focus on the following areas:

- Develop innovative monitoring tools to reduce negative impacts to aerial vertebrate species caused by existing and future renewable energy sites. The tools will be used by developers and decision-makers during the site selection process.
- Explore the feasibility of offshore wind farms as a viable renewable energy resource and determine what, if any, negative impacts there would be on the marine environment from the development of offshore wind turbines.
- Increase harbor porpoise survival rates by developing an acoustic monitoring tool that can aid planners in site selection of Marine Renewable Energy (MRE) facilities such that they will have minimal impacts on harbor porpoise populations.
- Reduce the potential negative impacts of wave energy conversion sites on shorelines by developing a tool to assess the changes in wave statistics near wave energy conversion (WEC) sites, and by creating a tool that can accurately predict large wave activity 72 hours in advance.
- Explore the environmental implications of potential energy scenarios for California to try to foresee and ultimately avoid unanticipated environmental impacts.

## **Exhibit A**

### **SCOPE OF WORK**

- Improve the desert solar power generation site selection process by developing methods of identifying suitable areas (i.e., areas that have a minimal impact on carbon balance) versus unsuitable areas (i.e., areas that have a negative impact on carbon balance) for solar power development, and by determining which vegetation types are the most active participants in the carbon exchange (with implications for air quality) and therefore are most in need of protection from potential site development.
- Improve the water management dialogue between fish conservation efforts and hydropower production proponents by assessing the tradeoffs between water use providing freshwater habitats for native fish populations and the cost-efficient provision of water to small hydropower installations.

#### **Objectives of the Agreement**

- Develop and test analytic tools for automated analysis that use aerial bioscatter from existing radar data to detect biological “hot-spots” of migratory and resident bird and bat populations. Implement a DNA-based method to identify populations mostly likely to be impacted by proposed energy facility development.
- Build and test a tool to assess the impacts on offshore atmosphere, ocean temperature, and the marine environment by simulating offshore wind power that would be created by an offshore wind farm. The tool will be developed using a dynamic coupled atmospheric-ocean model to better simulate offshore conditions.
- Develop and test a marine monitoring tool that uses autonomous porpoise click detectors (C-PODs) to determine harbor porpoises in areas of potential MRE sites. Simulations will be performed to determine the optimal spatial and temporal scales at which porpoise populations can most effectively be detected.
- Design an environmental tool for wave energy projects to assess the impact of the WEC installation on the oceanographic environment landward from the WEC site to the surf zone, so that planners can choose site locations where there is a minimal amount of degradation to the shoreline. Design an improved tool to predict/forecast wave events with significant wave heights greater than 15m, which would provide advance notice of impending storms that could tear WECs from their moorings and cause harm to people and structures ashore.
- Develop a tool to identify potential environmental issues associated with different energy development scenarios, including land-use impacts, air-quality impacts (e.g., fossil fuel and bioenergy impacts), and climate-change impacts.

## **Exhibit A**

### **SCOPE OF WORK**

- Develop techniques and models that can be used to judge potential solar development sites based on their vulnerability (due to loss of inorganic and organic carbon (C) that results from the disturbance caused by site development), in order to determine whether the carbon dioxide (CO<sub>2</sub>) saved by using solar electrical generation (as opposed to fossil fuel burning) is offset by this organic and inorganic C loss.
- Design and test a modeling tool that uses both a watershed hydrology and water management, in addition to a fish habitat suitability model. This tool will be used to assess the impacts of small hydropower plants on native fish populations.

#### **TASK 1.0 ADMINISTRATION**

##### **MEETINGS**

###### **Task 1.1 Attend Kick-off Meeting**

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

###### **The Contractor shall:**

- Attend a “kick-off” meeting with the Commission Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Commission Contract Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Contract Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Terms and conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Contract Manager’s expectations for accomplishing tasks described in the Scope of Work;
- An updated Schedule of Deliverables
- Progress Reports (Task 1.4)
- Technical Deliverables (Task 1.5)
- Final Report (Task 1.6)

The Commission Contract Manager shall designate the date and location of this meeting.

## **Exhibit A**

### **SCOPE OF WORK**

#### **Contractor Deliverables:**

- An Updated Schedule of Deliverables
- An Updated Gantt Chart (if included)
- An Updated List of Match Funds
- An Updated List of Permits

#### **Commission Contract Manager Deliverables:**

- Final Report Instructions

#### **Task 1.2 CPR Meetings**

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Contract Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Commission Contract Manager may schedule additional CPRs as necessary, and, if necessary, the budget will be reallocated to cover the additional costs borne by the Contractor, but the overall contract amount will not increase.

Participants include the Commission Contract Manager and the Contractor, and may include the Commission Contracts Officer, the PIER Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Commission Contract Manager to provide support to the Energy Commission.

#### **The Commission Contract Manager shall:**

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. I

## **Exhibit A**

### **SCOPE OF WORK**

- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

#### **The Contractor shall:**

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the Commission Contract Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

#### **Contractor Deliverables:**

- CPR Report(s)
- CPR deliverables identified in the Scope of Work

#### **Commission Contract Manager Deliverables:**

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

#### **Task 1.3 Final Meeting**

The goal of this task is to closeout this Agreement.

#### **The Contractor shall:**

- Meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Contractor, the Commission Contracts Officer, and the Commission Contract Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Contract Manager.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Commission Contract Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Contract Manager and the Contracts Officer about the following Agreement closeout items:

## **Exhibit A SCOPE OF WORK**

- What to do with any state-owned equipment (Options)
  - Need to file UCC.1 form re: Energy Commission's interest in patented technology
  - Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
  - Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
  - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
  - Final invoicing and release of retention
- 
- Prepare a schedule for completing the closeout activities for this Agreement.

### **Deliverables:**

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

### **REPORTING**

#### **See Exhibit D, Reports/Deliverables/Records.**

#### **Task 1.4 Quarterly Progress Reports**

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

#### **The Contractor shall:**

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

### **Deliverables:**

- Quarterly Progress Reports

#### **Task 1.5 Test Plans, Technical Reports and Interim Deliverables**

The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

## **Exhibit A**

### **SCOPE OF WORK**

#### **The Contractor shall:**

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

#### **Task 1.6 Final Report**

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The Commission Contract Manager will review and approve the Final Report. The Final Report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

The Final Report shall be a public document. If the Contractor has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Contractor shall perform the following subtasks for both the public and confidential versions of the Final Report.

#### **Task 1.6.1 Final Report Outline**

#### **The Contractor shall:**

- Prepare a draft outline of the Final Report.
- Submit the draft outline of Final Report to the Commission Contract Manager for review and approval. The Commission Contract Manager will provide written comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

#### **Deliverables:**

- Draft Outline of the Final Report
- Final Outline of the Final Report

## **Exhibit A**

### **SCOPE OF WORK**

#### **Task 1.6.2 Final Report**

##### **The Contractor shall:**

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the Commission Contract Manager for review and comment. The Commission Contract Manager will provide written comments within 10 working days of receipt.

Once agreement on the draft Final Report has been reached, the Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Commission Contract Manager shall provide written approval to the Contractor within 5 working days.

- Submit one bound copy of the Final Report with the final invoice.

##### **Deliverables:**

- Draft Final Report
- Final Report

#### **MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT**

##### **Task 1.7 Identify and Obtain Matching Funds**

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. While the PIER budget for this task will be zero dollars, the Contractor may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Contractor can incur any costs for which the Contractor will request reimbursement.

##### **The Contractor shall:**

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:
  1. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter.

## **Exhibit A**

### **SCOPE OF WORK**

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

- A list of the match funds that identifies the:
  - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
  - Amount of each in-kind contribution, a description, documented market or book value, and its 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 Contractor shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- A copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are significantly reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Contract Manager within 10 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

#### **Deliverables:**

- A letter regarding Match Funds or stating that no Match Funds are provided
- Letter(s) for New Match Funds
- A copy of each Match Fund commitment letter
- Letter that Match Funds were Reduced (if applicable)

#### **Task 1.8 Identify and Obtain Required Permits**

The goal of this task 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.

## **Exhibit A**

### **SCOPE OF WORK**

Permit costs and the expenses associated with obtaining permits are reimbursable under this Agreement. Permits must be identified in writing before the Contractor can incur any costs related to the use of the permit(s) for which the Contractor will request reimbursement.

#### **The Contractor shall:**

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:
  1. If there are no permits required at the start of this Agreement, then state such in the letter.
  2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
    - A list of the permits that identifies the:
      - Type of permit
      - Name, address and telephone number of the permitting jurisdictions or lead agencies
    - Schedule the Contractor will follow in applying for and obtaining these permits.
- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permits will be developed. The implications to the Agreement 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 the progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the appropriate information on each permit and an updated schedule to the Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Contract Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Contract Manager within 5 working days. Either of these events may trigger an additional CPR.

#### **Deliverables:**

- A letter documenting the Permits or stating that no Permits are required
- Updated list of Permits as they change during the Term of the Agreement
- Updated schedule for acquiring Permits as it changes during the Term of the Agreement
- A copy of each approved Permit

## **Exhibit A**

### **SCOPE OF WORK**

#### **Task 1.9 Electronic File Format**

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

#### **The Contractor shall:**

- Deliver documents to the Commission Contract Manager in the following formats:
  - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
  - PC-based text documents shall be in MS Word file format.
  - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
  - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

#### **Deliverables:**

- A letter requesting exemption from the Electronic File Format (if applicable)

### **TECHNICAL TASKS**

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.5. Deliverables not requiring a draft version are indicated by marking “(no draft)” after the deliverable name.

#### **Task 2 Development of Innovative Tools to Use Weather Data to Assess and Monitor Impacts of Existing and Future Energy Facilities on Aerial Faunas in California**

The goal of this task is to develop tools to facilitate identification of the biological hot-spots of migratory and aerial vertebrate activity in terrestrial and off-shore ecosystems throughout California, in order to determine how existing and future energy facility development will impact sensitive species such as migratory birds and bats. These tools will be developed using data from an existing remote-sensing network of weather radars, and will use novel molecular-based detection methods for determining species and populations most likely to be impacted by future energy development.

#### **The Contractor shall:**

- Develop an analytic tool for automated analysis to identify and quantify aerial bioscatter from current and archived NEXt Generation Weather RADar (NEXRAD) radar data for predicting “hot spots” of migratory and local activity of aerial vertebrates in relation to existing and planned energy development.

## **Exhibit A**

### **SCOPE OF WORK**

- Test analytic tools using archived data and historic counts of collision fatalities from existing wind turbine facilities in California to determine the effectiveness of developed tools for predicting geographic areas and local conditions at high risk of impacts to aerial vertebrates.
- Further test the analytic tool by performing a series of ground-based surveys to confirm the species and population identities of local and migratory aggregations of birds and bats. Conduct mist-netting for migratory birds during peak periods and collect genetic samples to be used to identify specific populations utilizing migratory corridors that may be impacted by energy development.
- Utilize DNA-based detection methodology that uses population-specific markers to identify specific migratory bird populations being surveyed.
- Prepare an analytic tool summary report titled “Analytic Tools to Assess and Monitor Impacts of Existing and Future Energy Facilities on Aerial Faunas in California”.

#### **Deliverables:**

- Analytic Tools to Assess and Monitor Impacts of Existing and Future Energy Facilities on Aerial Faunas in California Report (no draft)

#### **Task 3 Assessment of Offshore Wind Development Impacts on Marine Ecosystems**

The goal of this task is to build a tool from existing validated component models that can accurately assess offshore wind power while simulating direct impacts (atmosphere and ocean characteristic changes) and indirect impacts (marine ecological changes) of wind farms. A coupled dynamic modeling framework consisting of the Weather Research and Forecasting model (WRF) and the Regional Oceanic Modeling System (ROMS) will be implemented to determine wind power estimates and ecological impacts. An ecological/biogeochemical model has been implemented within ROMS, and will be used to simulate the effects of upwelling on the nutrient distribution of the ocean, which can then be used to predict the effects of wind power on marine health.

## **Exhibit A**

### **SCOPE OF WORK**

#### **The Contractor shall:**

- Build an assessment tool using coupled WRF (atmospheric) and ROMS (oceanic) models.
- Perform present-day (1981-2000) regional coastal climate reconstructions using data from historical climate archives at the lateral boundaries of the outer domains of both the atmospheric and oceanic models.
- Perform simulation #1 using coupled WRF-ROMS models with ocean biogeochemistry but without wind farms in order to obtain baseline data. This simulation will provide information on the atmospheric and oceanic conditions without the effects of wind power.
- Validate simulation #1 against existing point measurements and satellite data to allow for quantitative assessment of the model's performance.
- Perform simulation #2 using WRF forced with North American Regional Reanalysis lateral and sea surface temperature (SST) boundary conditions (land/atmosphere only). This simulation will subtract the effects of the ocean and examine only the effects of the atmosphere on wind power.
- Perform simulation #3 using WRF-ROMS with ocean biogeochemistry. This simulation will examine the effects of wind power on the atmosphere and the ocean.
- Evaluate the difference in marine biogeochemical quantities between the three simulations to quantify the impact of wind farms on marine ecosystems.
- Prepare a report on the results titled "Preliminary Assessment of Offshore Wind Development Impacts on Marine Ecosystems".

#### **Deliverables:**

- Preliminary Assessment of Offshore Wind Development Impacts on Marine Ecosystems Report (no draft)

#### **Task 4 Evaluation of a Passive Acoustic Monitoring Network for the Harbor Porpoise in California**

The goal of this task is to develop and evaluate the feasibility of a passive acoustic monitoring network for the harbor porpoise in California. The network will provide a critical tool for collecting baseline data and monitoring impacts of MRE facilities on this protected species. The harbor porpoise is particularly vulnerable to human activities such as fishing, noise, entrapment and vessel traffic, and has increasingly been displaced by human activities. A passive acoustic monitoring network could allow MRE planners to select sites where impacts to harbor porpoises are minimal.

#### **The Contractor shall:**

- Collect data to quantify the relationship between acoustic detections and harbor porpoise presence. This will be done through visual and acoustic porpoise detection studies at strategic locations in California, using autonomous porpoise click detector (C-POD) moorings, cliff-top observations, and low-altitude aerial surveys.
- Use collected data to determine spatial and temporal scales at which changes in harbor porpoise distribution can be detected.

## **Exhibit A**

### **SCOPE OF WORK**

- Develop alternate C-POD network designs based on the results of the spatial and temporal scales study.
- Perform simulations on alternate C-POD network designs to assess the capabilities of the monitoring networks to document observed distribution and movement patterns of the harbor porpoise using ten years of past fine-scale porpoise distribution data.
- Simulate scenarios of increasing and decreasing true porpoise abundance versus changes in distribution using aerial survey data.
- Apply model scenarios to potential network configurations around candidate MRE sites to determine most appropriate special arrangement for effective harbor porpoise monitoring.
- Prepare a report titled “Evaluation of a Passive Acoustic Monitoring Network for Harbor Porpoise Monitoring in California”.

#### **Deliverables:**

- Evaluation of a Passive Acoustic Monitoring Network for Harbor Porpoise Monitoring in California Report (no draft)

#### **Task 5 Development of an Environmental Impact Assessment Tool for Wave Energy Conversion**

The goal of this task is to integrate and use the Simulated Waves Nearshore (SWAN) and DELFT 3D wave simulation tools for environmental impact assessment of WEC, analyzing wave parameter statistics covering over 30 years from wave buoy data off the California coast. The tool will be used to assess degradation to the shoreline caused by WEC installations. An additional tool will be developed to predict (up to 72 hours in advance) large waves that could potentially cause WECs to be dislodged from their moorings and land ashore, causing injury to people and damage to property.

#### **The Contractor shall:**

- Review the status of WEC technologies and identify likely technologies that will be adopted for WECs in California.
- Develop statistical weather data for input to the wave energy model simulation and build a simulation model for statistical wave inputs to quantify the magnitude of energy.
- Select sites at Morro Bay and Point Arguello locations (or similar locations) for detailed impact analysis using WEC point absorbers such as the AquaBUoy and line absorbers such as Pelamus, both wave power devices. Establish SWAN and DELFT 3D models for the selected sites.
- Run the SWAN model at the selected locations. Run the DELFT 3D model to assess oceanographic impacts near shore (beach erosion and ocean current changes). Run both models with and without the WECs to identify the impact of WECs.
- Assess change in the normal wave statistics due to the presence of the WEC installation by varying WEC area and density from 25 MW to 1000 MW delivered power. Demonstrate the impact of the presence of WECs on the environment and evaluate the capacity of these models as environmental assessment tools.

## **Exhibit A**

### **SCOPE OF WORK**

- Analyze 30 years of wave parameter statistics from wave buoy data off the California coast; assess for the presence of waves with significant wave heights greater than 15 meters 4-5 miles off shore; simulate storms that cause large wave heights 4-5 miles off shore; and develop tools for large wave event probability and accurate 72 hour forecasts.
- Write a report titled “Environmental Impact Assessment Tool for Wave Energy Conversion”. The report will include a technical section summarizing the tool developed to assess the environmental impact of power generation from WECs as well as a technical section summarizing current assessment tools and their performance ranges.

#### **Deliverables:**

- Environmental Impact Assessment Tool for Wave Energy Conversion Report (no draft)

#### **Task 6 Assessment of the Potential Environmental Impacts of Alternative Energy Scenarios for California**

The goal of this task is to estimate the potential environmental impacts of different energy scenarios for California in order to anticipate future environmental issues. These energy scenarios are available via a companion PIER project.

#### **The Contractor shall:**

- Develop a methodology to estimate the land use implications of different energy technologies (e.g., square Kilometers per Megawatt capacity) and how to translate this method to the results of the Solar, Wind, Hydro, and Conventional Generation and Transmission Investment (SWITCH) model to estimate, at the highest level of geographical disaggregation, the land use implications of the different energy scenarios.
- Estimate the potential land-use impacts of the selected energy scenarios.
- Estimate the emissions of air pollutants that would be associated with the different scenarios to the highest levels of temporal (e.g., typical summer day) and geographical resolution (e.g., county or air basin or load zones) afforded by the SWITCH model.
- Examine current and potential water impacts of energy generation scenarios and investigate mitigation options such as increased water use efficiency, multiple-use cycles, and reclaimed water avenues.
- Examine the potential location of biomass energy resources using SWITCH and estimate the associated demands of water, fertilizer, and herbicide and land resource impacts.
- Develop methods that can be used with the SWITCH model to explore the effects of climate change on renewable sources of energy such as changes in hydropower availability, wind resources, and biomass resources.
- Prepare a report titled “Potential Environmental Impacts of Alternative Energy Scenarios for California”.

## **Exhibit A**

### **SCOPE OF WORK**

#### **Deliverables:**

- Potential Environmental Impacts of Alternative Energy Scenarios for California Report (no draft)

#### **Task 7 Measurement of the Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation**

The goal of this task is to develop measurements and adapt models to measure stored inorganic C, organic C balances of differing vegetation types, and changing soil temperature, moisture, and atmospheric CO<sub>2</sub> levels to determine if there are particular vegetation types that should be protected from disturbance or others that, from a perspective of C balance, are less sensitive. Caliche and organic matter losses compromise the value of solar energy as an alternative to fossil C burning by destroying the ability of the deserts to sequester C and potentially releasing large amounts of stored inorganic C into the atmosphere. Strategic site selection that factors in the presence or absence of carbon rich vegetation and caliche will ensure that the benefits of desert solar plants (e.g. reduced CO<sub>2</sub> emissions) outweigh the costs (e.g. sequestered carbon escaping into the atmosphere).

#### **The Contractor shall:**

- Measure caliche at various locations using soil pits and ground-penetrating radar (GPR). A number of locations in different vegetation types will be tested to determine the distribution of the caliche depths, roots and soil of soil pits.
- Take samples of caliche, soil and vegetation from multiple vegetation types, regions and soil depths to determine the exchange rates of <sup>13</sup>C-<sup>12</sup>C (from CO<sub>2</sub>) and <sup>16</sup>O-<sup>18</sup>O (from water) from the original deposition.  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  will be analyzed in the UC Riverside Center for Conservation Biology stable isotope facility (FIRMS) in order to determine the relationships between climate, vegetation, and soil C balance, using standard techniques and appropriate standards.
- Utilize a networked environmental observatory to measure C fixation, respiration and allocation. (Networked environmental observatories provide a combination of high temporal resolution and continuous observations.) Model organic carbon and calcium carbonate (CaCO<sub>3</sub>) dynamics under varying vegetation, soils and climate conditions.
- Monitor the fluxes of CO<sub>2</sub>, water (H<sub>2</sub>O) and energy of whole ecosystems at a spatial scale of hectares, using eddy covariance (EC). Two sites have been selected for this: alluvial vegetation at the Boyd Deep Canyon UC Natural Reserve and exposed lakebed and alluvial flats of the Salton Sea.
- Prepare a report titled "Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation".

#### **Deliverables:**

- Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation Report (no draft)

## **Exhibit A**

### **SCOPE OF WORK**

#### **Task 8 Development of a Modeling Tool to Assess and Mitigate the Effects of Small Hydropower on Stream Fishes in a Changing California Climate**

The goal of this task is to develop a fish habitat suitability model that uses an integrated modeling framework consisting of a watershed hydrology management model and a fish habitat suitability model to assess the impacts of small hydropower plants on freshwater fish populations in California.

##### **The Contractor shall:**

- Plan and conduct meetings with stakeholders to determine small hydropower operations and fish population and habitat goals.
- Perform a literature review to determine life-stage and run-specific functional relationships and critical thresholds for each freshwater site to be included in the model, e.g. mortality rates as a function of water temperature, egg survival and development rates, and critical temperature and flow requirements for volitional migration for adults.
- Develop a model for integration into the Water Evaluation and Planning (WEAP) framework. Input from WEAP will be temperature and flow.
- Calibrate model using historic data.
- Conduct a sensitivity analysis (feasibility test) to determine the robustness of model results.
- Conduct site visits to representative small hydropower facilities. Collect detailed water temperature data upstream and downstream of a representative small hydropower facility for use in model development and calibration.
- Plan and conduct a workshop near end of project to present the model to stakeholders.
- Prepare a report titled “Modeling Tool to Assess and Mitigate the Effects of Small Hydropower on Stream Fishes in a Changing California Climate”.

##### **Deliverables:**

- Modeling Tool to Assess and Mitigate the Effects of Small Hydropower on Stream Fishes in a Changing California Environment Report (no draft).