

CONTRACT REQUESTS FORM (CRF)



New Contract 500-11-020 Amendment to Existing Contract: _____ Amendment Number: _____

| Division | Contract Manager: | MS- | Phone | CM Training Date |
|---------------------------------|-------------------|-----|--------------|------------------|
| Energy Research and Development | Cheryl Closson | 43 | 916-327-2312 | 7/26/2010 |

| Contractor's Legal Name | Federal ID Number |
|---|-------------------|
| The Regents of the University of California on behalf of the Davis campus | 94-6036494 |

| Title of Project |
|--|
| Renewable Energy Resource, Technology and Economic Assessments |

| Term | Start Date | End Date | Amount |
|-----------------------|------------|-----------|--------------|
| New/Original Contract | 6/15/2012 | 6/30/2015 | \$ 2,000,000 |

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 | 5/9/2012 | <input type="checkbox"/> Consent | <input checked="" type="checkbox"/> Discussion |
| Business Meeting Presenter | Cheryl Closson | Time Needed: | 5 minutes |

Agenda Item Subject and Description

Possible approval of Contract #500-11-020 with the Regents of the University of California on behalf of the Davis campus for \$2,000,000 to provide resource, technical, barrier and economic assessments and research products on the major renewable energy resources to support achievement of California's renewable energy deployment goals. Researchers from UCSD and the CA Center for Sustainable Energy will also participate in the assessments. (PIER electricity funding.) Contact: Cheryl Closson. (5 minutes)

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 this contract is to conduct research to update and refine existing renewable energy resource and technology assessments and databases; provide for renewable energy assessments that are integrated, comparative and multi-dimensional; and address the complex issues arising from efforts to greatly increase California's use of its extensive renewable energy resources.

California Environmental Quality Act (CEQA) Compliance

1. 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":
2. 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: 15306
 - Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why contract is exempt under the above section:
 The project involves field mapping, sampling, and geophysical surveying activities that will not result in a significant environmental impact.
 - 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.

CONTRACT REQUESTS FORM (CRF)



| 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 | \$2,000,000 | Yes | PIER-E | 10-11 | 501.0271 | \$2,000,000 |
| ECAA | \$ | | \$ | | | | | \$ |
| State- ERPA | \$ | | \$ | | | | | \$ |
| Federal | \$ | | \$ | | | | | \$ |
| PIER - E | \$2,000,000 | | \$ | | | | | \$ |
| PIER - NG | \$ | | \$ | | | | | \$ |
| Reimbursement | \$ | | \$ | | | | | \$ |
| Other | \$ | | \$ | | | | | \$ |
| TOTAL: | \$2,000,000 | TOTAL: | \$2,000,000 | | TOTAL: | | | \$2,000,000 |
| Reimbursement Contract #: | | | | | Federal Agreement | | | |

| Contractor's Administrator/ Officer | | Contractor's Project Manager | |
|-------------------------------------|---------------------------------|------------------------------|-------------------------------------|
| Name: | Ahmad Hakim-Elahi | Name: | Bryan Jenkins |
| Address: | 1850 Research Park Dr Ste 300 | Address: | 376 Mrak Hall One Shields Avenue |
| City, State, Zip: | Davis, Ca 95618-6153 | City, State, Zip: | Davis, Ca 95618 |
| Phone/ Fax: | (530) 754-7700 / (530) 754-8229 | Phone/ Fax: | (530) 304-1108/(530) 754-8229 |
| E-Mail: | awards@ucdavis.edu | E-Mail: | bmjenkins@ucdavis.edu |

Contractor Is

Private Company (including non-profits)

CA State Agency (including UC and CSU)

Government Entity (i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state)

Selection Process Used

Solicitation Select Type Solicitation #: _____ # of Bids: _____ Low Bid? No Yes

Non Competitive Bid (Attach CEC 96)

Exempt Interagency

Civil Service Considerations

Not Applicable (Contract is with a CA State Entity or a membership/co-sponsorship)

Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)

The Services Contracted:

- are not available within civil service
- cannot be performed satisfactorily by civil service employees
- are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system.

The Services are of such an:

- urgent
- temporary, or
- occasional nature

that the delay to implement under civil service would frustrate their very purpose.

Justification:
Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)

Payment Method

A. Reimbursement in arrears based on:

- Itemized Monthly
- Itemized Quarterly
- Flat Rate
- One-time

B. Advanced Payment

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 contract rates are consistent with going rates in industry and academia, as well as with the rates negotiated for Energy Commission/UC interagency agreements. |

| | |
|---|--|
| 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: | California Center for Sustainable Energy | |
| | <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 checked="" type="checkbox"/> No | <input 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 | |
| 9. CEC 106, IT Component Reporting Form | | <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 | X | Feasibility Assessments for Co-Located Geothermal, Solar, Wind, and Biomass Resources in the Greater Los Angeles Basin |
| 3 | | Biomass Resources and Facilities Database Update |
| 4 | | Integrated Assessment of Sustainability for New or Existing Biomass Energy Sources in California |
| 5 | X | Integrated Assessments of Renewable Technology Options |
| 6 | | Biomass/MSW Technology Gap Assessment |
| 7 | | Biomass Gasification Technology Assessment |
| 8 | | Comparative Assessment of Technology Options for Biogas Clean-up |
| 9 | | California Off-Shore Wind Technology Assessment |
| 10 | | California Off-Shore Wind Energy Forum |
| 11 | X | Solar Heating and Cooling Technology Analysis |
| 12 | | Technical Assessment of Small Hydro Power Technologies |
| 13 | | Assessment of Geothermal Resources in Under-Served Regions |
| 14 | | Research Results Forum for Geothermal, Solar, Wind, Biomass, and Small Hydro |

KEY NAME LIST

| Task # | Key Personnel | Key Subcontractor(s) | Key Partner(s) |
|----------------------|------------------------|-----------------------------|-----------------------|
| 1, 2, 5, 14 | Bryan Jenkins | | |
| 2, 5, 13, 14 | William Glassley | | |
| 2, 3, 5, 6, 7, 8, 14 | Stephen Kaffka | | |
| 5, 11, 14 | Pieter Stroeve | | |
| 2, 5, 9, 10, 14 | Case Van Dam | | |
| 12, 14 | Jean-Pierre Delplanque | | |

GLOSSARY

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

| Acronym | Definition |
|-------------------|---|
| 3-D | three-dimensional |
| AB | Assembly Bill |
| CPR | Critical Project Review |
| CREC | California Renewable Energy Center |
| DOE | United States Department of Energy |
| Energy Commission | California Energy Commission |
| GHG | greenhouse gas |
| GIS | Geographic Information System |
| KGRA | Known Geothermal Resource Area |
| MS | Microsoft |
| MSW | municipal solid waste |
| NREL | National Renewable Energy Laboratory |
| PAG | PIER Renewable Energy Advisory Group |
| PDF | Portable Document Format |
| PIER | Public Interest Energy Research |
| R&D | research and development |
| RPS | Renewable Portfolio Standard |
| UCC.1 | Uniform Commercial Code (Financing Statement) |
| UCD | University of California at Davis |
| US | United States |

Problem Statement

California has established aggressive goals [via its Renewable Portfolio Standard (RPS) and Assembly Bill (AB) 32] goals to increase the use of renewable energy resources and decrease greenhouse gas (GHG) emissions. California policy makers, utilities, industries, state and local agencies, and project developers will need current information on the major renewable energy resources (biomass, geothermal, solar, wind, and small hydropower), technologies, and economics in order to reach established renewable energy goals, take advantage of renewable energy deployment opportunities, and address potential challenges. The California Energy Commission's (Energy Commission's) Public Interest Energy Research (PIER) Program provides much of the valuable renewable energy information needed by stakeholders.

PIER research goals and objectives are guided by input from the PIER Advisory Board, stakeholders, and the public. The PIER renewable energy research initiatives for 2011/2012 were recently reviewed by the PIER Advisory Board and its Renewable Energy Advisory Group. Several areas were identified to help fill in gaps in renewable energy research. These areas include projects to assess the feasibility of co-locating

solar, wind, and geothermal projects in a particular study area; development of reports on the benefits of utilizing biomass for energy production; assessment and updating of each of the major renewable energy technologies (biomass, wind, geothermal, and solar) relative to traditional generation; identification of cost barriers and strategies to overcome them; and assessment of biogas cleanup technologies for natural gas pipeline injection and what needs to be done to increase biogas viability in California.

The Energy Commission previously contracted with the University of California at Davis (UCD) to undertake research tasks and projects that are related to the PIER renewables research and development (R&D) goals and objectives. UCD established the California Renewable Energy Center (CREC) to conduct research and provide for efficient, cost effective and centralized administration of renewable energy groups that cover the major renewable energy sectors (solar, wind, geothermal, small hydropower, and biomass) and include representatives from government, academia, trade associations, utilities, private industry, environmental groups, and investors.

UCD's CREC was selected for this contract to take advantage of the broad renewable energy knowledge base and experience provided by CREC, as well as the academic excellence provided by UCD and the other University of California campuses.

Goals of the Agreement

The goals of the agreement are to:

- Address PIER Advisory Board and PIER Renewable Energy Advisory Group (PAG) research recommendations and Energy Commission needs for updated and integrated renewable energy resource, technology, economic, and environmental assessments and projects. Energy Commission staff will consult with the PAG on a regular basis regarding agreement research, findings and products.
- Support state level policy making and achievement of California renewable energy deployment goals; and
- Conduct data-driven and science-based analyses to answer emerging renewable energy technology and economic questions impartially and authoritatively.

Objectives of the Agreement

The objectives of the agreement are to:

- Update and refine existing renewable energy resource and technology assessments and databases needed by stakeholders;
- Provide for renewable energy assessments that are integrated, comparative, and multi-dimensional; and
- Address the complex issues and renewable energy development and integration data needs arising from efforts to greatly increase California's use of its extensive renewable energy resources.

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
- Critical Project Review (CPR) (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.

Contractor Deliverables:

- An Updated Schedule of Deliverables
- 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.
- 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:

- What to do with any state-owned equipment (Options)
- Need to file Uniform Commercial Code (Financing Statement) (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>

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

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.
 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.

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

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 Portable Document Format (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 Feasibility Assessments for Co-Located Geothermal, Solar, Wind, and Biomass Resources in the Greater Los Angeles Basin

The goal of this task is to establish the magnitude of co-located renewable resources, taking into account diurnal, seasonal, and annual variability. In addition, a preliminary cost/benefit analysis will be developed for use of these resources, taking into account natural gas displacement, reduction in use of far-from-user power generation, local economic impact and job creation, and avoided emissions. Included in this study will be a preliminary analysis of the technical feasibility of using hybrid configurations of renewable and natural gas generation technologies (primarily biomass), as well as three-dimensional (3-D) maps of the geothermal resources and associated databases.

The Contractor shall:

- Provide details of renewable energy availability (daily, seasonal and annual) for the Los Angeles Basin and estimate supply curves and geo-spatial distributions of geothermal, solar, wind, and biomass resources in the Los Angeles Basin.
- Develop databases and maps for Los Angeles Basin geothermal, solar, wind, and biomass resources for use in determining hybrid plant feasibility.
- For the geothermal component, provide 3-D representations of the geothermal resources using the geothermal database information.
- Develop an *Integrated Geothermal-Solar-Wind Resource Map* that quantifies energy available.
- Assess the technical and economic feasibility and investor requirements applicable to hybrid power plants that are co-located with geothermal resources.
- For technically feasible solutions, perform a detailed cost/benefit analysis that also quantifies displacement of natural gas, reduction in use of far-from-user

- Prepare a *Report on Potential Energy Availability of Co-Located Geothermal, Solar, Biomass and Wind Resources in the Greater Los Angeles Basin* that: (1) analyzes the technical feasibility and requirements of hybrid power plants co-located with geothermal resources; and (2) assesses resource availability for the following:
 - Solar thermal power co-location with geothermal resources.
 - Solar PV power co-location with geothermal resources.
 - Wind power co-location with geothermal resources.
 - Biomass power co-location with solar and/or wind resources.
- Evaluate natural gas displacement, economic impact, and emissions reductions for various scenarios for hybrid generation deployment.
- Analyze the potential economic integration of co-located energy conversion facilities and micro-grids supplied by multiple, diverse renewable sources.
- Prepare a Task Report titled *Costs and Benefits of Co-Located Renewable Resources in the Greater Los Angeles Basin*.
- Prepare a Critical Project Review Report consistent with Task 1.2 requirements.
- Participate in a Critical Project Review per Task 1.2 requirements.

Deliverables:

- Databases and maps of renewable energy resources in the Greater Los Angeles Basin developed for use in determining hybrid plant feasibility (no drafts)
- *Integrated Geothermal-Solar-Wind Resource Map* (no draft)
- *Report on Potential Energy Availability of Co-Located Geothermal, Solar, Biomass and Wind Resources in the Greater Los Angeles Basin* (no draft)
- Task Report - *Costs and Benefits of Co-Located Renewable Resources in the Greater Los Angeles Basin*
- Critical Project Review Report (no draft)

Task 3 Biomass Resources and Facilities Database Update

The goal of this task is to prepare an annual update of the biomass resource inventory at the state and regional level, including both tabulated and Geographic Information System (GIS) level data sets. Data are expected to be provided from diverse research tasks as they progress.

The Contractor shall:

- Update the California biomass resource assessment information provided in the Energy Commission's *2010 Biomass Resource Assessment Report* and existing databases for use in preparing annual biomass resource assessment reports and database updates.
- Complete two *Annual Updates of the Biomass Resource Inventory Database* (for 2012 and 2013) in MS Excel or another appropriate format. Data may also be published on the Contractor's website after receiving permission from the Commission Contract Manager.

- Update inventory database information as necessary after submittal of each *Annual Updates of the Biomass Resource Inventory Database*, submit data to the Commission Contract Manager, and post the data on the Contractor website as they are developed after receiving approval from the Commission Contract Manager.
- Provide one or more *Notification Letters* to the Commission Contract Manager on the changes to the *Biomass Resource Inventory Database*.
- Update, maintain, and improve the *Biomass Facilities Reporting System*, including mechanisms for data gathering, consolidation, quality control, and dissemination.
- Prepare an *Updated List of New, Existing or Abandoned Biomass Energy Facilities and Bio-Refineries*.
- Enhance the data collection and reporting of a statewide database system for biomass energy and related facilities, including thermal station power plants, digesters, landfill gas systems, fermentation plants, bio-refineries, other biomass energy converters, selected bio-based product manufacturing, material handling and processing operations, and storage units.
- Analyze data collected, report trends, and generate statewide profiles and evaluations.
- Prepare two *Annual Biomass Resource Assessment Reports* (for 2012 and 2013) that provide inventory updates and analyses of data collected, trends, profiles, and evaluations.
- Provide collected data information to the Commission Contract Manager for public dissemination, and provide updates to the information quarterly or as data become available. Data may be posted on the Contractor website after receiving permission from the Commission Contract Manager.

Deliverables:

- 2012 *Annual Update of the Biomass Resource Inventory Database* (in MS Excel or other appropriate format) (no draft)
- 2013 *Annual Update of the Biomass Resource Inventory Database* (in MS Excel or other appropriate format) (no draft)
- *Notification Letter(s)* on changes to the *Biomass Resource Inventory Database* (no draft)
- *Updated List of New, Existing or Abandoned Biomass Energy Facilities and Bio-Refineries* (no draft)
- 2012 *Annual Biomass Resource Assessment Report*
- 2013 *Annual Biomass Resource Assessment Report*

Task 4 Integrated Assessment of Sustainability for New or Existing Biomass Energy Sources in California

The goal of this task is to assess the social, economic, and environmental benefits of using biomass for energy (liquid fuels, gases, and electricity) production. The effort will monetize benefits by sector (agriculture, urban, forestry), and create and employ analytical tools to assess the sustainability of selected crop, forest, and organic waste-based bioenergy feedstock production and conversion systems in California, as identified by the Energy Commission, the Bioenergy Interagency Workgroup, and other entities.

The Contractor shall:

- Build on existing Contractor modeling and analytical capacity to create integrated analyses of biomass energy projects, including assessment of non-energy benefits (i.e., benefits or values not captured in the price of electricity) to assist in cost-effectiveness of projects, and provide net benefit analyses of proposed or potential new biomass energy projects. The use of the California Bio-Refinery Siting Model will be incorporated in analyses, linking energy production to necessary energy and transportation infrastructure where appropriate. (The Bio-Refinery Model was developed at UCD to predict optimal bioenergy supply chains given various scenario configurations.)
- With Commission Contract Manager concurrence, select projects for analysis with objectives focused on forestry residue use, food industry and related feedstock materials, municipal solid waste (MSW) and bio-solids use, and improved assessment of sustainable agricultural feedstock supplies.
- Analyze other biomass projects suggested by the Energy Commission and agreed upon by all parties in a discussion. Analyses will integrate economic, engineering and landscape processes affected by biomass energy projects where possible and provide the opportunity to evaluate multiple types of environmental, social, and policy effects. For projects that have limited or no landscape footprints, like those that focus on the use of residues or biomass resources like post recycled MSW, collaborative process is essential. This involves public participation in the collection, analysis, and interpretation of data.
- Prepare and submit for review and comment two *Integrated Assessment of Sustainability for New or Existing Biomass Energy Sources in California* annual reports (for 2012 and 2013) that document specific biomass sustainability assessment reports and include monetized benefits by sector and publicly available, web-based data and analytical tools supporting the analysis. The reports will aid the public process of defining sustainability for projects identified by the Energy Commission/PIER program or the Bioenergy Interagency Workgroup.

Deliverables:

- *2012 Integrated Assessment of Sustainability for New or Existing Biomass Energy Sources in California*
- *2013 Integrated Assessment of Sustainability for New or Existing Biomass Energy Sources in California*

Task 5 Integrated Assessments of Renewable Technology Options

The goal of this task is to provide technical and economic assessments and updates of the major renewable technology options (biomass, geothermal, solar and wind), including summarizing and comparing various electricity generation technologies, and identifying technologies that increase the value of renewable energy (such as energy storage, hybrid use with natural gas, or other strategies to reduce intermittency and increase capacity factors). It will provide technology assessments that are linked to the Energy Commission's renewable policy drivers, while identifying and addressing barriers to commercialization, and discussing R&D necessary for the technology to

reach commercialization. This requires summarizing and comparing biomass, wind, geothermal and solar electricity generation technologies, using accepted economic comparison metrics and models consistent with prior Energy Commission-funded comparisons. Comparisons will illuminate the economic attractiveness of renewable energy solutions to fossil and other non-renewable generation alternatives, both present and future, as well as the types of research projects that could be funded that would significantly increase their comparative monetized benefits. This work will provide state-of-the-art descriptions of the renewable energy industries in California, describing the barriers that prevent them from reaching their individual and collective potential contribution to RPS goals.

The Contractor shall:

- Separately assess each of the major renewable energy resources – biomass, geothermal, solar (including PV), and wind – as follows:
 - Analyze the state of the subject resource generation technology in California, relative to international state-of-the-art technology.
 - Assess the extent to which the subject resource industry is accessing available resources, and identify technical and regulatory barriers for those situations in which greater development is possible.
 - Identify research needs that would overcome the identified barriers.
 - Identify opportunities for diverse subject resource-based power generation facilities in California.
 - Create a technology overview that identifies policy drivers, barriers, and needed R&D; provides tables and graphs summarizing and describing major candidate subject resource energy technologies and their descriptions; includes major resource segments, technology, and economic assessments; and provides links and citations to references.
 - Identify applicable technologies that could increase the value of the renewable energy resources by reducing intermittency and/or increasing capacity factors.
 - Identify ways in which subject resource-based power facilities can be integrated with or complement other alternative and renewable power systems.
 - For the biomass assessment, evaluate and recommend cost-effective strategies for collecting and distributing biomass, including the feasibility of “densification” or other technologies to lower costs of feedstock transportation.
- Prepare Assessment Reports for biomass, geothermal, solar, and wind renewable energy resources titled: (1) *Biomass Energy in California’s Future: Barriers, Opportunities and Research Needs*; (2) *Geothermal Energy in California’s Future: Barriers, Opportunities and Research Needs*; (3) *Solar Energy in California’s Future: Barriers, Opportunities and Research Needs*; and (4) *Wind Energy in California’s Future: Barriers, Opportunities and Research Needs*. Each report will include recommendations for follow-on efforts and will be submitted to the Commission Contract Manager for review and comment. Each report shall:

- Analyze the state of the subject renewable energy resource development and conversion technology used in California relative to international state-of-the-art technology, and assess the extent to which the California industry is using the best available solutions and accessing the highest quality and most readily developable resources.
- Identify technical and regulatory barriers for those situations in which greater development is possible.
- Summarize and compare resource and conversion technology options and variations and industry and resource segments, linking each to the state's policy drivers, barriers to technological development, and R&D needed to overcome technology and cost barriers to more rapid adoption.
- Summarize the technical and economic status and deployment potential of selected conversion technology options.
- Summarize and compare various electricity generation technologies (biomass, geothermal, wind and solar), linking each to the Energy Commission's renewable policy drivers, barriers to commercialization, and R&D for the technology to reach commercialization.
- Assess how economically competitive biomass, geothermal, solar and wind generation costs are relative to one another and alternative generation options available to California policy makers, referring to and updating prior comparisons conducted by the Energy Commission and published as a part of the Integrated Energy Policy Report proceedings.
- Outline solar and wind cost trends over time, referring to and updating prior analysis funded by PIER in 2009.
- Identify the greatest cost and other barriers to solar, wind, biomass, and geothermal generation, referring to and updating prior analysis funded by PIER in 2009; how to overcome these barriers to technology deployment; and what types of research projects can be funded that would deploy technologies.
- Coordinate individual collaborative efforts such that efforts and deliverables specified below use consistent assumptions and deliver comparable results.
- Prepare a Task Report titled *Integrated Assessments of Renewable Technology Options* that presents task integrated analyses, findings, and comparisons on the renewable energy technologies, costs, competitiveness, barriers, and types of future research needed to deploy technologies. The report shall include portfolio comparisons and identify and compare alternative renewable portfolios that could meet evolving renewable portfolio standards in California, using different mixes of distributed and centralized renewable electricity sources. The report shall also include a framework for comparing the benefits and costs of building, community, and utility scale renewable power from solar, wind, geothermal, biomass and small hydro sources.
- Prepare a Critical Project Review Report consistent with Task 1.2 requirements.
- Participate in a Critical Project Review per Task 1.2 requirements.

Deliverables:

- *Biomass Energy in California's Future: Barriers, Opportunities and Research Needs*

- *Geothermal Energy in California's Future: Barriers, Opportunities and Research Needs*
- *Solar Energy in California's Future: Barriers, Opportunities and Research Needs*
- *Wind Energy in California's Future: Barriers, Opportunities and Research Needs*
- *Integrated Assessments of Renewable Technology Options*
- Critical Project Review Report (no draft)

Task 6 Biomass/MSW Technology Gap Assessment

The goal of this task is to assess gaps in the current knowledge and understanding of MSW conversion technologies, including existing and new thermochemical and biochemical processes for conversion of MSW to energy. Barriers to the adoption of new technologies, including inconsistent regulation, interconnection issues and qualification for inclusion in RPS energy portfolios, are included as subjects for analyses.

The Contractor shall:

- Summarize experience and standards that apply to MSW conversion to energy for power generation, biofuels, biogas, and other bio-products.
- Identify obstacles and barriers to more complete and effective use of MSW for power, fuels, and other products.
- Identify means to increase the beneficial uses of the MSW biomass resources in California.
- Conduct a survey of MSW conversion options suitable for deployment in California and prepare a corresponding *Report on Survey of MSW Conversion Options* that describes the issues, barriers, and potential solutions to broader and more cost-effective and environmentally acceptable use of this diverse and abundant biomass resource.
- Prepare a Task Report titled *Biomass/Municipal Solid Waste Technology Gap Assessment* that summarizes task findings and includes technology gap assessment that describes and addresses development issues, barriers, and solutions.

Deliverables:

- *Report on Survey of MSW Conversion Options* (no draft)
- *Biomass/Municipal Solid Waste Technology Gap Assessment*

Task 7 Biomass Gasification Technology Assessment

The goal of this task is to conduct a comprehensive engineering, economic and market assessment of thermo-chemical and other biomass gasification technologies receiving R&D support or commercialization attention in California and provide for public review of the assessment results.

The Contractor shall:

- Assess commercialization status, applicability, and commercialization prospects of biomass gasification receiving Energy Commission-administered deployment incentives or R&D attention over the past decade.

- Review and highlight various gasification technologies (including those in the United States and Europe, as well as integrated gasification combined cycle) including barriers and R&D needed to make the technologies economically competitive.
- Assess the current economics and market share of current commercial biomass gasification offerings that apply to California's most abundant bio-energy feedstocks.
- Prepare a Task Report titled *Biomass Gasification Technology Assessment* that addresses improvement of biomass gasification technology and an economic and market assessment of thermo-chemical and other biomass gasification technologies.
- Help the Energy Commission conduct a workshop to review above-mentioned task assessments and report, proposed ranking criteria, market barriers and net deployment benefits.
- Document workshop results in a *Workshop Summary*.

Deliverables:

- *Biomass Gasification Technology Assessment*
- *Workshop Summary* (no draft)

Task 8 Comparative Assessment of Technology Options for Biogas Clean-up

The goals of this task are to identify the standards that processed biogas must meet to be injected into California pipelines or converted directly to power using commercially available engine-generators, turbine-generators, and fuel cells, as well as the technologies that are in development or commercially available that can meet these standards.

The Contractor shall:

- Summarize experience and standards that apply to biogas used for distributed power generation.
- Determine gas injection standards that currently apply in California and any expected changes resulting from on-going standards development activity or commercial experience in the United States (US) or other industrialized countries.
- Assess commercialization status, applicability, and commercialization prospects of biogas clean-up technologies that are offered commercially, are being developed with industry funding, and/or have received Energy Commission-administered deployment incentives, R&D attention, and/or investment over the past decade. Provide a competitive assessment of biogas cleanup technologies for advancement of the use of biogas sources for distributed generation.
- Collect data on biogas quality and composition (e.g. purity and contaminants, energy content) by source.
- Collect data on typical raw gas quality for major sources of biogas including but not limited to: landfills, wastewater treatment plants, manure digesters, municipal solid waste digesters, and biomass gasifiers.
- Collect data on cost and performance of emerging biogas utilization technologies (flaring, reciprocating engines, micro-turbines, fuel cells, natural gas pipeline injection, and vehicle fueling).
- Collect data on specific performance and cost information related to air quality,

GHGs, and economics/operations.

- Prepare a Task Report titled *Comparative Assessment of Technology Options for Biogas Clean-up* that includes a comparative assessment of biogas clean up options and status of related standards development, and recommends further R&D.
- Help the Energy Commission conduct a workshop to review the above-mentioned assessments, R&D needs, market experience, market barriers, and net deployment benefits.
- Document workshop results in a *Workshop Summary*.

Deliverables:

- *Comparative Assessment of Technology Options for Biogas Clean-up*
- *Workshop Summary* (no draft)

Task 9 California Off-Shore Wind Technology Assessment

The goals of this task are to determine which off-shore wind technologies are suitable for California, when they would likely be available for commercialization, what technologies would be commercialized and available to help the state meet its 33% by 2020 RPS goals, and what R&D is needed to accelerate the commercialization.

The Contractor shall:

- Study off-shore wind technologies based on fixed and floating structures.
- Evaluate the applicability of these technologies to California off-shore installations (e.g., wind resource, water depth, fixed/floating, wave height, Operation and Maintenance needs, and installation requirements).
- Determine technology maturation time lines.
- Evaluate the cost of energy.
- Study match of generation based on the above technologies and California's load.
- Determine generation capacity based on the above information.
- Prepare a Task Report titled *California Off-Shore Wind Technology Assessment* that includes all information developed and evaluated as part of the task.

Deliverables:

- *California Off-Shore Wind Technology Assessment*

Task 10 California Off-Shore Wind Energy Forum

The goal of this task is to help the Energy Commission organize a California Off-Shore Wind Energy Forum for regulators, system operators, utilities, industry, the U.S. Department of Energy, federal laboratories, environmentalists, and academia. The forum will be used to determine and discuss hurdles facing the development of off-shore wind in California and the potential for off-shore wind to contribute to future RPS goals. In addition, the forum will examine the potential for off-shore wind to contribute to the 33% by 2020 RPS goal by locating turbines on existing off-shore infrastructure (off-shore oil and gas rigs).

The Contractor shall:

- In coordination with the Energy Commission, find a suitable location for the forum.

- Help the Energy Commission set up a web-based registration site for the forum.
- Help the Energy Commission identify and invite experts to give presentations on off-shore wind energy.
- Help the Energy Commission develop an appropriate forum agenda.
- Help the Energy Commission widely advertise the forum.
- Record the forum presentations, discussions, and conclusions for inclusion in the Task Report identified below.
- Provide organizational, technical, and logistical support before, during, and after the forum.
- Prepare a Task Report titled *California Off-Shore Wind Energy Forum Report* that includes forum attendance lists, an agenda, copies of presentations, detailed notes from all technical session discussions, and summaries of major findings and conclusions from each technical session.

Deliverables:

- *California Off-Shore Wind Energy Forum Report*

Task 11 Solar Heating and Cooling Technology Analysis

The goal of this task is to analyze solar heating and cooling technology options and penetration scenarios for California. The analysis will include a determination of the extent to which each option and scenario will help California achieve GHG emissions savings with each option and scenario. After the analysis is performed, a plan will be developed in partnership with industry stakeholders to increase and widen the penetration of solar heating and cooling technologies that can reduce electricity usage and on-peak demand, thus contributing to the state's RPS goals and supplementing the effects of the state's investment in energy efficiency programs.

The Contractor shall:

- Assess markets as follows:
 - Analyze solar heating and cooling technology options and penetration scenarios for California (including PV, hybrid technologies, and industrial applications), including the extent to which each option and scenario would help California achieve its energy efficiency and carbon emission reduction goals.
 - Determine the carbon emissions reduction benefit from each option and scenario.
 - Identify classes of businesses that would benefit from solar thermal or integrated solar thermal/biomass (biogas) systems. Identify, contact, and engage potential partners for analysis and design portions. Particular emphasis will be placed on partnering with California's food processing industry. The Contractor has recently reported on the types, locations, and energy potential of food processors in California. This task will build on that assessment and also involve directly working with the food processing industry organizations. Recent survey results and industry contacts will be used to help identify interested cooperating food and other industry participants.

- Meet with interested individuals, groups, and companies identified in the above effort. Define alternative energy needs and existing energy potentials. Identify appropriate solar and biomass based alternative energy systems that are cost effective and save/produce energy.
- Develop a list of interested cooperating food and other industry participants.
- Assess technology, economic and environmental issues as follows:
 - Propose integrated energy systems appropriate to the needs of users identified in the market assessment. Based on the efforts above to identify cost-effective solutions, develop process design, control, economics, integration, and environmental studies for solar heating and cooling technology options.
 - Analyze costs and benefits of adopting integrated energy systems (e.g. solar thermal plus biomass and hybrid solar thermal systems backed up by grid electricity and natural gas). Both direct and indirect costs and benefits will be calculated, including compliance with California environmental regulations.
 - Develop metrics and standards to evaluate energy savings from solar heating and cooling.
 - Make recommendations designed to incentivize investment into solar heating and cooling technologies.
- Prepare a Task Report on *California's Solar Heating and Cooling Options*. The report will assess the GHG reductions resulting from various technology penetration scenarios; assess the potential impacts (including but not limited to technical, economic, and environmental impacts) of direct solar heating and cooling penetration into the California food, agricultural and other industries; provide solar heating/cooling metrics and standards documents; and provide analysis and recommendations on development of integrated energy systems that use direct solar heating and cooling as a renewable energy source.
- Prepare a Critical Project Review Report consistent with Task 1.2 requirements.
- Participate in a Critical Project Review per Task 1.2 requirements.

Deliverables:

- List of interested cooperating food and other industry participants. (no draft)
- Task Report on *California's Solar Heating and Cooling Options*
- Critical Project Review Report (no draft)

Task 12 Technical Assessment of Small Hydro Power Technologies

The goal of this task is to investigate and assess available small hydro power generation technologies and associated operating and performance parameters.

The Contractor shall:

- Take an inventory of various small hydro power generation technology types and identify the applications to which each technology type is relevant.
- Prepare an *Inventory of Current In-Conduit Small Hydroelectric Generation Technologies*.
- Review existing and new turbine and generation technologies.

- Assess the simulation needs for quantitative evaluation of generation technologies.
- Provide evaluation criteria to assess the likely viability and usefulness of new generation technologies.
- Prepare a Task Report titled *Analysis of the Status of Small Hydro Deployment in California* that includes a technical assessment of small hydro implementing technologies.

Deliverables:

- *Inventory of Current In-Conduit Small Hydroelectric Generation Technologies* (no draft)
- *Analysis of the Status of Small Hydro Deployment in California*

TASK 13 Assessment of Geothermal Resources in Under-Served Regions

The goal of this task is to develop a methodology for assessing geothermal resources that may be useful in regions that possess inadequate expert capability to undertake such assessments. Many counties in California possess modest geothermal resources that, if developed, could significantly improve local and regional economic conditions. However, such locations commonly lack sufficient indigenous knowledge and skills to plan, execute and analyze resource capacity and potential applications. Some of these locations include Known Geothermal Resource Areas (KGRAs), such as Surprise Valley, Wendell-Amadee, and Long Valley. However, some regions have clear indication of the presence of a geothermal resource but have not been designated a KGRA because of lack of sufficient data to justify such a designation. Examples of such areas include but are not limited to San Luis Obispo County, parts of Sonoma County outside of the Geysers KGRA, Susanville, and other sites. These diverse locations have in common manifestations of geothermal resources, but there is inadequate data to evaluate the magnitude of the resource, which thwarts further exploration or development of strategies for deploying potentially useful applications.

The Contractor shall:

- Identify target communities and regions to participate in this task, list the communities and regions in an *Inventory of Regions and Communities*, and invite them to participate in the assessment (with Commission Contract Manager concurrence).
- Use the results of previous Energy Commission Geothermal Grant and Loan Program and PIER projects undertaken in such settings to develop a lessons learned document titled *Assessing and Developing Geothermal Resources – Prior Project Lessons Learned*.
- In coordination with the Energy Commission, conduct a workshop to discuss needs particular to potential target areas. With Commission Contract Manager concurrence, identify a region for undertaking a model assessment. Prepare a *Target Areas Workshop Summary*, including attendees, describing the lessons learned from previous studies, workshop discussion, findings and conclusions regarding the needs of affected regions, and target areas for assessment, including the site selected for study, and submit to the Commission Contract Manger.

- With participation from the involved communities and appropriate educational institutions, initiate a reconnaissance assessment of a geothermal resource in the selected target region. The reconnaissance assessment will include field mapping, sampling, and surveying.
- In advance of conducting field work, prepare an appropriate *Reconnaissance Assessment Plan* that describes the activities to be undertaken, any permits and/or environmental compliance documents required and when permits will be issued, identifies access permissions, sampling protocols, and field safety provisions. Submit plan to the Commission Contract Manager for review and comment prior to initiation of field work.
- In coordination with the Energy Commission, hold a Preliminary Resource Assessment Workshop to discuss and evaluate assessment progress and results, and develop a template methodology for use in other regions. Prepare a *Preliminary Resource Assessment Workshop Summary*, including attendees, preliminary resource assessment data and information, discussions, findings and conclusions, and submit to the Commission Contract Manager.
- Prepare a Task Report that addresses all task activities and includes resource assessment data and a template for geothermal assessments in other regions and settings.

Deliverables:

- *Inventory of Regions and Communities* (no draft)
- *Assessing and Developing Geothermal Resources – Prior Project Lessons Learned* (no draft)
- *Target Areas Workshop Summary* (no draft)
- *Reconnaissance Assessment Plan*
- *Preliminary Resource Assessment Workshop Summary* (no draft)
- Task Report

Task 14 Research Results Forum for Geothermal, Solar, Wind, Biomass and Small Hydro and Policy Briefings for Legislature or Other Agencies

The goals of this task are to help the Energy Commission organize and conduct a Research Results Forum that: addresses each renewable energy resource area; allows discussion of the agreement research results and other R&D results [e.g., United States Department of Energy (DOE), National Renewable Energy Laboratory (NREL), and others]; supports progress towards meeting California’s renewable energy goals and future R&D needed to reach California’s renewable energy goals; and assist the Energy Commission with policy briefings that may be necessary to apprise the Legislature or other agencies of research results and potential policy impacts.

The Contractor shall:

- In coordination with the Energy Commission, find a suitable location for the Research Results Forum.
- Help the Energy Commission identify and invite forum presenters.
- Help the Energy Commission develop an appropriate forum agenda.

- Record the forum presentations, discussions, and conclusions for use by the Energy Commission and inclusion in the *Research Results Forum Report*.
- Provide organizational, technical, and logistical support before, during, and after the forum.
- Prepare a *Research Results Forum Report* that includes forum attendance lists, an agenda, copies of presentations, detailed notes from all technical session discussions, and summaries of major findings and conclusions from each technical session.
- Participate with Energy Commission representatives in policy briefings for the Legislature or other agencies as necessary to convey research results and discuss potential renewable energy policy impacts and/or recommendations.

Deliverables:

- *Research Results Forum Report*