

**CONTRACT REQUEST FORM (CRF)**



A) New Agreement 500-15-007 (To be completed by CGL Office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Timothy Smith		916-327-1551

C) Contractor's Legal Name	Federal ID Number
The Regents of the University of California, Santa Cruz	

**D) Title of Project**  
 Investigate Climate-Change-Induced Vulnerability of the Northern California Natural Gas Energy System and Identify Resilience Options

E) Term and Amount	Start Date	End Date	Amount
	6/30/2016	9/20/2018	\$ 600,000

**F) Business Meeting Information**

Operational agreement (see CAM Manual for list) to be approved by Executive Director

ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	6/14/2016	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Guido Franco	Time Needed:	5 minutes

Please select one list serve. NaturalGas (NG Research Program)

**Agenda Item Subject and Description**  
 UNIVERSITY OF CALIFORNIA, SANTA CRUZ. Proposed resolution approving Agreement 500-15-007 with The Regents of the University of California, on behalf of the Santa Cruz Campus for a \$600,000 contract to investigate climate vulnerability of the natural gas energy infrastructure in Northern California considering concurrent, compounding, and dependent climate extremes. This is critical to preparing for and mitigating the negative effects of climatic change and variability, as well as extreme weather events on natural gas infrastructure.(Natural gas funding)

**G) California Environmental Quality Act (CEQA) Compliance**

1. Is Agreement considered a "Project" under CEQA?  
 Yes (skip to question 2)  No (complete the following (PRC 21065 and 14 CCR 15378)):  
 Explain why Agreement is not considered a "Project":  
 Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because

2. If Agreement is considered a "Project" under CEQA:  
 a) Agreement **IS** exempt. (Attach draft NOE)  
 Statutory Exemption. List PRC and/or CCR section number: \_\_\_\_\_  
 Categorical Exemption. List CCR section number: Cal. Code Regs., tit 14, § 15306  
 Common Sense Exemption. 14 CCR 15061 (b) (3)  
 Explain reason why Agreement is exempt under the above section:  
 The research consists of basic data collection, research, experimental management, and resource evaluation activities. The research is to investigate climate vulnerability of the natural gas energy system and identify resilience options. This research does not result in a serious or major disturbance to an environmental resource.

b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)  
 Check all that apply

<input type="checkbox"/> Initial Study	<input type="checkbox"/> Environmental Impact Report
<input type="checkbox"/> Negative Declaration	<input type="checkbox"/> Statement of Overriding Considerations
<input type="checkbox"/> Mitigated Negative Declaration	

**H) List all subcontractors (major and minor) and equipment vendors:** (attach additional sheets as necessary)

Legal Company Name:	Budget	SB	MB	DVBE
Purdue University	\$ 50,000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
California State University, Fresno Foundation	\$ 38,136	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**I) List all key partners:** (attach additional sheets as necessary)

Legal Company Name:

**CONTRACT REQUEST FORM (CRF)**

CEC-94 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

**J) Budget Information**

Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	14-15	501.0011	\$600,000
			\$
R&D Program Area: EGRO: EA		TOTAL:	\$600,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

**K) Contractor's Administrator/ Officer**

Contractor's Administrator/ Officer				Contractor's Project Manager			
Name:	Lynn Crowder			Name:	Yihsu Chen		
Address:	1156 High St.			Address:	1156 High St		
City, State, Zip:	Santa Cruz, CA 95064-1077			City, State, Zip:	Santa Cruz, CA 95064-1077		
Phone:	831-459-1378 /	Fax:	- -	Phone:	831-502-7184 /	Fax:	- -
E-Mail:	lcrowder@ucsc.edu			E-Mail:	yihsuchen@ucsc.edu		

**L) Selection Process Used** (For amendments, address amendment exemption or NCB, do not identify solicitation type of original agreement. )

Solicitation Select Type Solicitation #: \_\_\_\_\_ # of Bids: \_\_\_\_\_ Low Bid?  No  Yes  
 Non Competitive Bid (Attach CEC 96)  
 Exempt Interagency

**M) Contractor Entity Type**

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)

**N) Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE?**

No  Yes  
 If yes, check appropriate box:  SB  MB  DVBE

**O) Civil Service Considerations**

Not Applicable (Agreement 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:****P) Payment Method**

A. Reimbursement in arrears based on:  
 Itemized Monthly  Itemized Quarterly  Flat Rate  One-time  
 B. Advanced Payment  
 C. Other, explain:

**Q) Retention**

1. Is Agreement subject to retention?  No  Yes  
 If Yes, Will retention be released prior to Agreement termination?  No  Yes

**R) Justification of Rates**

Rates have been negotiated between the Energy Commission and the University of California.



**s) Disabled Veteran Business Enterprise Program (DVBE)**

1.  Exempt (Interagency/Other Government Entity)

2.  Meets DVBE Requirements      DVBE Amount:\$ \_\_\_\_\_ DVBE %: \_\_\_\_\_  
 Contractor is Certified DVBE  
 Contractor is Subcontracting with a DVBE: \_\_\_\_\_

3.  Contractor selected through CMAS or MSA with no DVBE participation.

4.  Requesting DVBE Exemption (attach CEC 95)

**T) Miscellaneous Contract Information**

1. Will there be Work Authorizations?       No       Yes

2. Is the Contractor providing confidential information?       No       Yes

3. Is the Contractor going to purchase equipment?       No       Yes

4. Check frequency of progress reports  
 Monthly     Quarterly     \_\_\_\_\_

5. Will a final report be required?       No       Yes

6. Is the agreement, with amendments, longer than a year? If yes, why?       No       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.

**u) The following items should be attached to this CRF (as applicable)**

1. Exhibit A, Scope of Work	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<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 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. CEQA Documentation	<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

\_\_\_\_\_  
**Agreement Manager**      **Date**      **Office Manager**      **Date**      **Deputy Director**      **Date**

# Exhibit A

## Project Summary & Scope of Work

### Project Summary/Abstract

*Briefly describe the long-term objectives for achieving the stated goals of the project.*

#### **Agreement Goals**

The goals of this Agreement are to support the research that develops resilience options for the North California natural gas energy system to reduce the impacts of climate-change-induced hazards on the Northern California natural gas energy system and the local economies.

**Ratepayer Benefits:** This Agreement will result in the ratepayer benefit of the successful implementation of the proposed natural gas system resilience work. Resilience here is defined as the ability of a natural gas system to resist, absorb, accommodate, and recover from the impacts of climate change in a timely manner, including mitigation of the impacts and restoration of its essential functions. One third of the energy consumed in California is natural gas. More importantly, a majority of power generation fleets in California are powered by natural gas. Thus, a disruption of the natural gas system in California due to climate-change-induced events will not only adversely affect natural gas companies, but also have undesirable ramifications that would spill over to the rest of the economy. The successful implementation of the proposed work will provide a way by which resilience options can be implemented in order to minimize those impacts.

**Technological Advancement and Breakthroughs:** This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by developing a system-level risk-analysis framework that builds upon bottom-up modeling of the natural gas system coupled with state-wide or regional economic models to address the vulnerability of the Northern California natural gas system to climate-change-induced weather events (specifically, storms and sea-level rise) and to identify resilience options and the timing of their implementation.

#### **Agreement Objectives**

The objectives of this Agreement are to produce the following products that allow assessing vulnerability, and identifying timing and choices of possible resilience options:

- Digitized geo-referenced maps that illustrate hazard and physical vulnerability of the Northern California natural-gas energy system due to climate-change-induced events;
- Optimization-based engineering-economic bottom-up natural gas energy models of the Northern California system with the capability to couple it with regional economic models; and
- Decision support tools that allow investigating of the implementation timing of resilience options, considering the uncertainties of climate change events.

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### Project Summary & Scope of Work

#### If Third-Party Confidential Information is to be provided by the State:

- Performance of the Scope of Work is anticipated to involve use of third-party Confidential Information and is subject to the terms of this Agreement; **OR**
- A separate CNDA between the University and third-party is required by the third-party and is incorporated in this Agreement as Exhibit A7.

### Scope of Work

#### I. TASK ACRONYM/TERM LISTS

##### TASK LIST

Task #	CPR <sup>1</sup>	Task Name
1		General Project Tasks
2		Hazard Identification and Physical Vulnerability Assessment
3	x	Model the Northern California Natural Gas Energy System
4		Stochastic Modeling of Resilience Options
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

#### ACRONYMS/GLOSSARY

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

Acronym	Definition
ARCCA	Alliance of Regional Collaboratives for Climate Adaptation
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
PG&E	Pacific Gas & Electric
PIER	Public Interest Energy Research
TAC	Technical Advisory Committee

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

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### Project Summary & Scope of Work

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

### A. Purpose of Agreement

The purpose of this Agreement is to develop a system-level risk-analysis framework to address vulnerability of the Northern California natural gas system to climate-change-induced weather events and to identify resilience options and the timing needed for their implementation.

### B. Problem/ Solution Statement

#### Problem

Climate-change-induced hazards are likely to increase the risks of the California natural gas energy system, either due to its physical condition or its location in climate-change hazardous areas. While the existing infrastructure is mainly designed to sustain 100-year events, the effects of climate change might skew the underlying distributions, leading to a more frequent occurrence of those events in the near future. The situation could be exacerbated by the fact that there is significant uncertainty in predicting the timing and location of climate-change-induced hazards.

A traditional approach that examines individual components of the system deterministically and separately could either underestimate or overestimate the system vulnerability because it would overlook the network effects. That is, the malfunction of one component of a system would either 1) compensate by alternative routes, thereby restoring the system to the normal operation conditions or 2) trigger a chain of reactions that eventually spill over to the rest of the system, or into other sectors that rely on natural gas as input factors.

#### Solution

The Contractor will build a bottom-up model of the natural gas energy system, coupled with state-wide or regional economic models, to address the vulnerability of the Northern California natural gas energy system to climate-change-induced weather events (specifically, storms and sea-level rise) and to identify resilience options and the timing of their implementation. The research team will work very closely with natural gas utilities and local stakeholders that the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA) will bring to this project.

## III. TASK 1 GENERAL PROJECT TASKS

### **DELIVERABLES**

#### **Subtask 1.1 Deliverables**

The goal of this subtask is to establish the requirements for submitting project deliverables (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Contractor must provide deliverables as required below by the dates listed in the **Schedule of Deliverables (Part V)**. Deliverables that require a draft version are indicated by marking “**(draft and final)**” after the deliverable name in the “Deliverables” section of the task/subtask. If “(draft and final)” does not appear after the

## Exhibit A

### Project Summary & Scope of Work

deliverable name, only a final version of the deliverable is required. With respect to due dates within this Scope of Work, “**days**” means working days.

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

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

- Submit all draft deliverables to the CAM for review and comment in accordance with the Schedule of Deliverables (Part V). The CAM will provide written comments to the Contractor on the draft deliverable within 15 days of receipt, unless otherwise specified in the task/subtask for which the deliverable is required.
- Consider incorporating all CAM comments into the final product. If the Contractor disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final deliverable.
- Submit the revised deliverable with responses and comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For deliverables that require a final version only

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

For all deliverables

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

#### Instructions for Submitting Electronic Files and Developing Software:

##### ○ **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format.
- The Contractor must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

##### ○ **Software Application Development**

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### Project Summary & Scope of Work

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

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

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

### MEETINGS

#### Subtask 1.2 Kick-off Meeting

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

#### The Contractor shall:

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

The administrative portion of the meeting will include discussion of the following:

- Terms and conditions of the Agreement;
- Deliverables (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
- An updated Project Schedule;
- Deliverables (subtask 1.1);
- Progress reports and invoices (subtask 1.5);

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### Project Summary & Scope of Work

- Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
  - Any other relevant topics.
- Provide an *Updated Schedule of Deliverables, List of Match Funds, and List of Permits*, as needed to reflect any changes in the documents.

#### The CAM shall:

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

#### Contractor Deliverables:

- Updated Schedule of Deliverables (*if applicable*)
- Updated List of Match Funds (*if applicable*)
- Updated List of Permits (*if applicable*)

#### CAM Deliverable:

- Kick-off Meeting Agenda

#### Subtask 1.3 Critical Project Review (CPR) Meetings

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

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

#### The Contractor shall:

- Prepare a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Submit the CPR Report along with any other *Task Deliverables* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 deliverables along with the CPR Report).
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

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### Project Summary & Scope of Work

#### The CAM shall:

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

#### Contractor Deliverables:

- CPR Report(s)
- Task Deliverables (draft and/or final as specified in the task)

#### CAM Deliverables:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

#### Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

#### The Contractor shall:

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

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
  - Disposition of any state-owned equipment.
  - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
  - The Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables).

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### Project Summary & Scope of Work

- Need to document the 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 *Final Meeting Agreement Summary* that documents any agreement made between the Contractor and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Deliverables* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

#### Deliverables:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written Deliverables

### REPORTS AND INVOICES

#### Subtask 1.5 Progress Reports and Invoices

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

#### The Contractor shall:

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

#### Deliverables:

- Progress Reports
- Invoices

#### Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Contractor must use the Style Manual provided by the CAM.

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### Project Summary & Scope of Work

#### Subtask 1.6.1 Final Report Outline

##### The Contractor shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM. (See *Task 1.1* for requirements for draft and final deliverables.)

##### Contractor Deliverables:

- Final Report Outline (draft and final)

##### CAM Deliverables:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

#### Subtask 1.6.2 Final Report

##### The Contractor shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)
    - Appendices (if applicable) (Create a separate volume if very large.)
    - Attachments (if applicable)
  - Ensure that the document is written in the third person.
  - Ensure that the Executive Summary is understandable to the lay public.
    - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
    - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
    - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.

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- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Contractor on the draft product within 15 days of receipt.
- Consider incorporating all CAM comments into the Final Report. If the Contractor disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

#### Deliverables:

- Final Report (draft and final)
- Written Responses to Comments on the Draft Final Report

#### CAM Deliverable:

- Written Comments on the Draft Final Report

### **MATCH FUNDS, PERMITS, AND SUBCONTRACTS**

#### Subtask 1.7 Match Funds

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

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

#### The Contractor shall:

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

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

- A list of the match funds that identifies:

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- The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
- The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Contractor must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
- A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

#### Deliverables:

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

#### Subtask 1.8 Permits

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

#### The Contractor shall:

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

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

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### Project Summary & Scope of Work

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

#### Deliverables:

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

#### Subtask 1.9 Subcontracts

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

#### The Contractor shall:

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

#### Deliverables:

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

### TECHNICAL ADVISORY COMMITTEE

#### Subtask 1.10 Technical Advisory Committee (TAC)

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

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or

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- Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review deliverables and provide recommendations for needed deliverable adjustments, refinements, or enhancements.
  - Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
  - Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project deliverables.

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

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

#### The Contractor shall:

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

#### Deliverables:

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

#### Subtask 1.11 TAC Meetings

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

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#### The Contractor shall:

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

#### Deliverables:

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

## IV. TECHNICAL TASKS

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

### TASK 2: HAZARD IDENTIFICATION AND PHYSICAL VULNERABILITY ASSESSEMENT

The goal of this task is to identify the vulnerability of the Northern California natural gas system.

#### The Contractor shall:

- Identify possible climate-change-induced hazards to the Northern California natural gas energy system, e.g., inland flooding, mudslides, wildfires, subsidence, storm events and sea-level rise.
- Assess physical vulnerability of the natural-gas system by examining the physical setting of the Northern California natural-gas system, including transmission, storage, and distribution on facilities and pipelines, and the adjacent environmental conditions (system supported infrastructure and geological conditions).
- Acquire general information on the Northern California natural gas energy system (e.g., engineering setting and spatial distribution of the gas system, physical conditions of the environment, etc.) (from Pacific Gas & Electric) and climate-change downscaled data (from the University of California, San Diego), with the California Energy Commission’s assistance.

## Exhibit A

### Project Summary & Scope of Work

- Prepare and provide a technical memorandum entitled *Assessment of Northern California Natural-gas Energy System Climate-Change-Induced Hazard and Physical Vulnerability* that will include the following:
  - Geographical mapping of identified climate-change-induced hazards at different severity levels.
  - Exposure analysis and mapping on the natural-gas system to the climate-change-induced hazards.
  - Assessments of potential direct damages to the natural-gas system resulting from the climate-change-induced hazards.

#### Deliverables:

- Assessment of Northern California Natural-gas Energy System Climate-Change-Induced Hazard and Physical Vulnerability Memorandum

### TASK 3: MODELING THE NORTHERN CALIFORNIA NATURAL GAS ENERGY SYSTEM

The goal of this task is to capture behavior of natural gas entities and the engineering or technological details in the system to restore the system and the market back to normal conditions when facing weather-induced shocks to the natural gas system.

#### The Contractor shall:

- Develop a bottom-up engineering-economic model of the Northern California natural-gas energy system to simulate the operation of this system by modeling its behavior as cost-minimizing subject to fixed demand.
- Couple the bottom-up engineering-economic model of the Northern California natural-gas energy system with county-level or regional economic models to assess overall system vulnerability. Hazard and physical vulnerability data developed in Task 2 will be used as inputs to simulate the impacts of various service disruption scenarios.
- Participate in a CPR and prepare a CPR Report as described in Subtask 1.3.
- Detail information of the Northern California natural gas energy system to be obtained from PG&E including system (e.g., network), topology, engineering data (e.g., pipe characteristics), operation costs, demand data, etc.
- Prepare and provide a technical memorandum: *Northern California Natural-Gas Energy System Vulnerability Modeling* that summarizes the findings of this task.

#### Deliverables:

- CPR Report
- Northern California Natural-Gas Energy System Vulnerability Modeling Memorandum

### TASK 4: STOCHASTIC MODELING OF RESILIENCE OPTIONS

The goal of this task is to incorporate scenario-based uncertainties using stochastic techniques in order to identify resilience options.

#### The Contractor shall:

- Develop a stochastic version of the bottom-up engineering-economic model of the Northern California natural-gas energy system.

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### Project Summary & Scope of Work

- Develop a set of scenarios (based on Task 2) to represent the uncertainties associated with climate-change-induced hazards for the Northern California natural-gas energy system.
- Consult with the Energy Commission and PG&E to identify a set of feasible options to increase the resilience of the Northern California natural-gas energy system while considering their implementation costs, performance, and applicability to the existing system.
- Apply a path-dependent approach to evaluate time-linked resilience options of the Northern California natural-gas energy system in the face of climate-change-induced hazards.
- Prepare a technical memorandum: *Assessment of the Resilience Options of Northern California Natural-Gas Energy System*, that summarizes the findings of this task.

#### Deliverables:

- Assessment of the Resilience Options of Northern California Natural-Gas Energy System Memorandum

#### TASK 5: EVALUATION OF PROJECT BENEFITS

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

#### The Contractor shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
  - For Product Development Projects and Project Demonstrations:
    - Published documents, including date, title, and periodical name.
    - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
    - Greenhouse gas and criteria emissions reductions.
    - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
    - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
    - A discussion of project product downloads from websites, and publications in technical journals.
    - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
  - Additional Information for Product Development Projects:

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### Project Summary & Scope of Work

- Outcome of product development efforts, such copyrights and license agreements.
- Units sold or projected to be sold in California and outside of California.
- Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
- Investment dollars/follow-on private funding as a result of Energy Commission funding.
- Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
  - Outcome of demonstrations and status of technology.
  - Number of similar installations.
  - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or has resulted in other non-energy benefits.
  - An estimate of energy and non-energy benefits.
  - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
  - A discussion of project deliverable downloads from websites, and publications in technical journals.
  - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Contractor similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

#### Deliverables:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

#### **TASK 6: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

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

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results.

## Exhibit A

### Project Summary & Scope of Work

- Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
    - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
    - A description of the intended use(s) for and users of the project results.
    - Published documents, including date, title, and periodical name.
    - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
    - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
    - The number of website downloads or public requests for project results.
    - Additional areas as determined by the CAM.
  - Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
  - When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop(s) on the project.
  - When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
  - Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
  - Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

#### Deliverables:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- High Quality Digital Photographs
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

## V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: UNIVERSITY OF CALIFORNIA, SANTA CRUZ

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

**RESOLVED**, that the Energy Commission approves Agreement 500-15-007 with the Regents of the University of California, on behalf of the Santa Cruz campus for a \$600,000 contract to investigate climate vulnerability of the natural gas energy infrastructure in Northern California considering concurrent, compounding and dependent climate extremes. This project will support research to prepare for and mitigate the negative effects of climatic change and variability, as well as extreme weather events on natural gas infrastructure; and

**FURTHER BE IT RESOLVED**, that the Executive Director or his/her designee shall execute the same on behalf of the Energy Commission.

**CERTIFICATION**

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the California Energy Commission held on June 14, 2016.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

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Cody Goldthrite,  
Secretariat