

CONTRACT REQUEST FORM (CRF)



A) New Agreement 500-15-005 (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, Irvine Campus	95-2226406

D) Title of Project
A Multi-Hazard Investigation of Climate Vulnerability of the Natural Gas Energy System in Southern California

E) Term and Amount	Start Date	End Date	Amount
	6/30/2016	9/20/2018	\$ 893,692

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	Timothy Smith	Time Needed:	5 minutes

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

Agenda Item Subject and Description

The Regents of the University of California, Irvine Campus. Proposed resolution approving Agreement 500-15-005 with The Regents of the University of California, Irvine Campus for a \$893,692 contract to investigate climate vulnerability of the natural gas energy infrastructure in Southern California considering concurrent, compounding and dependent climate extremes. This project will support research to prepare for and mitigate the negative effects of climate change, climate variability and extreme weather events on natural gas infrastructure.

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 this agreement provides funding for analysis of extremes in a changing climate using historical observations and future climate computer model simulations. This work consists of utilization of existing computer models, data gathering, and analysis performed on computers, academic research, production of regional maps, preparation of technical memorandums, a stakeholder engagement, and meetings. These activities do not involve any physical changes in the environment and therefore this work is not a project pursuant to California Code of Regulations, title 14, section 15378.

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: _____
 Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why Agreement is exempt under the above section:

b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
 Initial Study Environmental Impact Report
 Negative Declaration Statement of Overriding Considerations
 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
The Regents of the University of California, on behalf of the Los Angeles Campus	\$ 294,226	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Government Commission (LGC)	\$ 20,000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate Readiness Institute - The Regents of the University of California, Berkeley Campus.	\$ 10,000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CONTRACT REQUEST FORM (CRF)

CEC-94 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION



I) List all key partners: (attach additional sheets as necessary)
Legal Company Name:

J) Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
NG Subaccount, PIERDD	14-15	501.0011	\$893,692
			\$
R&D Program Area: EGRO: EA		TOTAL:	\$893,692
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

K) Contractor's Administrator/ Officer				Contractor's Project Manager			
Name:	Jasmin Ramirez			Name:	Amir AghaKouchak		
Address:	5171 California Ave Ste 150			Address:	221 Engineering Laboratory Facility		
City, State, Zip:	Irvine, CA 92617-3067			City, State, Zip:	Irvine, CA 92697-0001		
Phone:	949-824 2460 /	Fax:	- -	Phone:	949-824-9350 /	Fax:	- -
E-Mail:	jasminjr@uci.edu			E-Mail:	amir.a@uci.edu		

L) Selection Process Used (For amendments, address amendment exemption or NCB, do not identify solicitation type of original agreement.)						
<input type="checkbox"/> Solicitation	Select Type	Solicitation #:	# of Bids:	Low Bid?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
<input type="checkbox"/> Non Competitive Bid	(Attach CEC 96)					
<input checked="" type="checkbox"/> Exempt	Interagency					

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

N) 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

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

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

Q) Retention		
1. Is Agreement subject to retention?	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
If Yes, Will retention be released prior to Agreement termination?	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes

**R) Justification of Rates**

Rates have been negotiated between the California Energy Commission and the Regents of 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 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. CEQA Documentation | <input checked="" type="checkbox"/> N/A | <input 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 investigate:

- Compounding effects of land subsidence, sea level rise and extreme precipitation on levee failure and seawall overtopping. Levees and seawalls currently protect key infrastructure resources including those of the natural gas system. The results will lead to not only risk of failure based upon individual extremes under climate change, but the joint risk of compounding extremes. Using already available subsidence data, we will focus upon estimating change in overtopping risk (e.g., for a 100-year flood) for different plausible subsidence levels.
- Changes in the intensity-duration-frequency of precipitation extremes in our study area in the past and future. The project will also explore the cascading effect of a change in the intensity-duration-frequency on riverine flooding.
- Compounding changes in soil moisture and temperature due to extreme events (e.g., prolonged droughts and floods) that can threaten California levees including natural gas infrastructure protected by levees.
- Compounding effects of high magnitude natural gas pressure dynamics, which are critical to determining infrastructure longevity and probability of failure and that will undoubtedly be caused by weather extremes and high use of intermittent renewable power in California.

Ratepayer Benefits:¹ This Agreement will result in the ratepayer benefits of greater electricity reliability and increased safety by providing critical information on weaknesses and vulnerabilities of the natural gas energy system.

Technological Advancement and Breakthroughs:² This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by providing information on vulnerability to individual and joint climatic extremes (e.g., compounding effects of droughts and heatwaves). Furthermore, the Agreement will develop statistical frameworks that can be used for assessing the impacts of a nonstationary and changing future climate on Southern California's natural gas infrastructure.

Agreement Objectives

The objectives of this Agreement are to:

- Prepare Technical memorandum *Characterizing the Changes in the Intensity-Duration-Frequency of Precipitation Extremes in Southern California*.

¹ California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

² California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

Exhibit A

Project Summary & Scope of Work

- Prepare Technical memorandum *Characterizing the Compounding Effect of Land Subsidence, Sea Level Rise and Extreme Precipitation*.
- Prepare Map of *Regions of High Risk of Failure under Different Future Climate Conditions*.
- Prepare Technical memorandum *Changes or Improvements to the Natural Gas System to Significantly Decrease Natural Gas System Vulnerability to Pressure Dynamics Caused by Weather Extremes with High Intermittent Renewable Use*.
- Properly characterize the potential effect to the natural gas system to the compounding effect of weather/climate related multiple-hazards.
- Properly characterize the potential effect to the natural gas system due to changes in the intensity-duration-frequency of precipitation extremes in Southern California.
- Quantify the effects of compounding changes in soil moisture and temperature due to extreme events that could threaten natural gas infrastructure. Map regions of high risk of failure under different future climate conditions.
- Properly characterize the compounding effects of high magnitude natural gas pressure dynamics caused by weather extremes and high use of intermittent renewable power in California.

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 ³	Task Name
1		General Project Tasks
2		Characterizing the compounding effect of land subsidence, sea level rise and extreme precipitation
3		Characterize the potential effect to the natural gas system to the changes in the intensity-duration-frequency of precipitation extremes
4	X	Quantify the effects of compounding changes in soil moisture and temperature due to extreme events

³ Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

Exhibit A

Project Summary & Scope of Work

Task #	CPR ³	Task Name
5		Compounding effects of high magnitude natural gas pressure dynamics
6		Improve Cal-Adapt for natural gas utilities and improve climate scenario downscaling and provide support for meaningful stakeholder engagement
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

ACRONYMS/GLOSSARY

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

Acronym	Definition
APEP	Advanced Power and Energy Program
ARCCA	Alliance of Regional Collaboratives for Climate Adaptation
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CMIP5	Coupled Model Intercomparison Project
CPR	Critical Project Review
DWR	California Department of Water Resources
Energy Commission	California Energy Commission
GCM	Global Climate Model
GIS	Geographic Information System
IDF	Intensity-Duration-Frequency
LGC	Local Government Commission
NISSA	Non-Isothermal Soil Strength Analysis
PIER	Public Interest Energy Research
SLR	Sea Level Rise
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to support research to develop a system-level risk analysis to address vulnerability of the Southern California natural gas infrastructure system to current and future climate extremes.

B. Problem/ Solution Statement

Problem

Extreme climatic events are growing more severe and frequent, calling into question how prepared our infrastructure is to deal with these changes. Increases in frequency of extremes

Exhibit A

Project Summary & Scope of Work

(e.g., floods, heatwaves, dry spells) can lead to damages to infrastructure such as levees, dams, roads and energy infrastructure systems. Most previous studies focus solely on changes in the future climate. This agreement will focus on assessing climate change impact on the natural gas energy system in Southern California.

Furthermore, most previous studies considered climate impacts based on a certain type of extreme event (e.g., floods). A combination of climate events (e.g., high/low precipitation, high/low temperatures, flooding, etc.) may cause a significant impact on the infrastructure and society, though individual climatic events involved may not be severe extremes themselves. For this reason, climate vulnerability analysis should go beyond analyzing one extreme at the time. This Agreement includes multi-hazard assessment of the climate vulnerability of the natural gas energy infrastructure in Southern California considering, concurrent, compounding and dependent climate extremes.

Solution

The Contractor will use a new statistical framework for analyzing extremes in a changing climate. Using historical observations and future climate model simulations, downscaled and bias corrected for California (available from the Scripps Institute of Oceanography). Land subsidence data is available from the Jet Propulsion Laboratory and natural gas pressure dynamics and pipeline materials characterizations are available from Southern California Gas Company. The statistical model allows considering for the combined effect of multiple extremes, as well as temporal changes (nonstationarity) in extreme events. For the natural gas system in Southern California, the project will provide vulnerability to individual and joint climatic extremes as they directly and indirectly affect the natural gas system vulnerability. The final products will be mapped in a Geographic Information System (GIS) friendly format.

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 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.

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- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final 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**

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.

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- 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);
 - 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*.

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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.

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.

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- 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).
 - 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.

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- 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.

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.*)

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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 that discusses the specific Energy Commission-funded research activities, results and conclusions. (**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.
 - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.

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- 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 Recipient on the draft product within 15 days of receipt.
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised 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:
 - 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.

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- 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 recipients. 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.

- 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*.

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- 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
 - 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.

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- 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

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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: Characterizing the Compounding Effect of Land Subsidence, Sea level rise and Extreme Precipitation

The goal of this task is to properly characterize the potential effect to the natural gas system to the compounding effect of weather/climate related multiple-hazards.

The Contractor shall:

- Investigate changes in frequency of extreme precipitation events and their potential impacts on natural gas infrastructure and then evaluate the compounding effects of coastal flooding and sea level rise (SLR).
- Use three sets of data to implement multivariate (consideration of multiple factors at the same time) coastal flood risk analysis for the current and future climate with rising sea levels. The data must include as a minimum: i) historical hourly water level observed at tide gauges (available from National Oceanic and Atmospheric Administration), ii) future local SLR projections to describe the impacts of SLR on increased risk of flooding, and iii) historic freshwater inflow to the lower estuary as a representative of terrestrial/river flow (available from United States Geological Survey. We will use downscaled and bias corrected Coupled Model Intercomparison Project (CMIP5) projections for California (available from the Scripps Institute of Oceanography under Interagency Agreement 500-14-005) under Representative Concentration Pathway 4.5 and 8.5 for future scenarios (two potential climate scenarios).
- Perform a joint risk analysis to the natural gas system from the combined precipitation, SLR, and river flows.
- Produce a technical memorandum entitled *Characterizing the Compounding Effect of Land Subsidence, Sea Level Rise and Extreme Precipitation*.

Deliverables:

- Technical memorandum *Characterizing the Compounding Effect of Land Subsidence, Sea Level Rise and Extreme Precipitation*

TASK 3: Characterize the Potential Effect to the Natural Gas System to the Changes in the Intensity-Duration-Frequency of Precipitation Extremes

The goal of this task is to properly characterize the potential effect to the natural gas system due to changes in the intensity-duration-frequency of precipitation extremes in Southern California.

The Contractor shall:

- Assess the effect of climate nonstationarity (changes in statistic of extremes over time) on intensity-duration-frequency of precipitation (IDF) curves and the occurrence of extremes.
- Developed a generalized framework for constructing IDF curves under nonstationary and future climate conditions.

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- Use projected daily downscaled CMIP5 precipitation simulations for evaluating future IDF curves relative to the historical extreme weather events.
- Produce a technical memorandum entitled *Characterizing the Changes in the Intensity-Duration-Frequency of Precipitation Extremes in Southern California*.

Deliverables:

- Technical memorandum *Characterizing the Changes in the Intensity-Duration-Frequency of Precipitation Extremes in Southern California*.

TASK 4: Quantify the Effects of Compounding Changes in Soil Moisture and Temperature Due to Extreme Events

The goal of this task is to quantify the effects of compounding changes in soil moisture and temperature due to extreme events that could threaten natural gas infrastructure.

The Contractor shall:

- Address this research gap by linking climatic variability (e.g., wet and dry spells) to behavior of soil shear strength.
- Quantify the effect of climate extremes on soil shear strength. Using a recently developed model, Non-Isothermal Soil Strength Analysis (NISSA) to evaluate soil shear strength response to concurrent space-time variations of soil moisture and temperature.
- Use NISSA framework to evaluate vulnerability of Southern California natural gas infrastructure to future droughts and wet periods (from CMIP5 projections).
- Produce a regional map of areas with *Regions of High Risk of Failure under Different Future Climate Conditions*.
- Participate in a CPR meeting and prepare a CPR Report in accordance with subtask 1.3 (CPR Meetings).

Deliverables:

- Map of Regions of High Risk of Failure under Different Future Climate Conditions.
- CPR Report #1

TASK 5: Compounding Effects of High Magnitude Natural Gas Pressure Dynamics

The goal of this task is to properly characterize the compounding effects of high magnitude natural gas pressure dynamics caused by weather extremes and high use of intermittent renewable power in California.

The Contractor shall:

- Utilize existing Advanced Power and Energy Program (APEP) models to accurately model the pressure dynamics (hydraulics) of Southern California natural gas infrastructure.
- Analyze a multitude of renewable intermittency problems including the spatial and temporal distributions of electric wind generation intermittency, the potential use of hybrid energy storage systems and various means of gas energy storage to complement renewable wind power intermittency.
- Develop and analyze several scenarios to consider a number of current and future conditions and how those conditions will impact Southern California's natural gas system during weather extreme demand conditions.

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- Produce a technical memorandum entitled *Changes or Improvements to the Natural Gas System to Significantly Decrease Natural Gas System Vulnerability to Pressure Dynamics Caused by Weather Extremes with High Intermittent Renewable Use*.

Deliverables:

- Technical memorandum *Changes or Improvements to the Natural Gas System to Significantly Decrease Natural Gas System Vulnerability to Pressure Dynamics Caused by Weather Extremes with High Intermittent Renewable Use*.

TASK 6: Improve Cal-Adapt for Natural Gas Utilities and Improve Climate Scenario Downscaling and Provide Support for Meaningful Stakeholder Engagement

The goal of this task is to improve Cal-Adapt usefulness to natural gas utilities and their customers, improve climate scenarios, and to coordinate with the Local Government Commission to utilize its network of climate change adaptation stakeholders and experts in Southern California

Task 6.1 Improve Cal-Adapt for Natural Gas Utilities and Improve Climate Scenario Downscaling

The goals of this task are 1) to provide high level of technical expertise with enough sophistication in communication and stakeholder engagement to improve the usefulness of Cal-Adapt to natural gas utilities and their customers, and 2) to improve University of California at Los Angeles's climate scenarios by bringing them to 90-km resolution and incorporating low cloud changes.

The Contractor Shall:

- Develop brief, plain-English summary of the rationale behind the 10 Global Climate Models for which regionally downscaled results are shown on Cal-Adapt (to be reviewed by the Energy Commission's Technical Advisory Committee for Cal-Adapt developed under contract 500-14-003, which includes representation for DWR). Incorporate feedback from Technical Advisory Committee and prepare Memo Summarizing *Selection of 10 GCMs*, which will be available for the Cal-Adapt development team to post under ongoing Energy Commission Agreements (500-14-003, EPC-15-008).
- Develop a brief, plain-English summary of the rationale behind selection, and recommendations for use, of climate scenarios for California's Fourth Climate Change Assessment, and prepare a Memo Regarding *Choice and Use of Selected Scenarios for California's Fourth Climate Change Assessment*.
- Develop brief, plain-English summary of main differences between "new" Cal-Adapt and the "old" version, particularly with regard to scenarios (Representative Concentration Pathways vs. Special Report on Emissions Scenarios), downscaling routine (Local Constructed Analogs vs. Monthly Bias-Correction and Spatial Downscaling / Daily Bias-Correction constructed Analogs, etc. After review by Technical Advisory Committee, incorporate feedback and prepare Memo *Detailing Differences Between Cal-Adapt 2.0 and the Original 2011 Cal-Adapt*, which will then be posted on Cal-Adapt.
- Survey of how natural gas utilities are using Cal-Adapt and how to improve the services provided via Cal-Adapt. This survey will leverage the Energy Commission's Technical Advisory Committee for Cal-Adapt developed under contract 500-14-003, which includes

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representatives from natural gas Investor-Owned Utilities. Prepare a Memo Regarding *Use of Cal-Adapt by Natural Gas Utilities* based on survey results.

- Analyses of trends and climate projections that will be available in Cal-Adapt in a way that would be useful for natural gas utilities and their customers. Prepare *Technical Memo Regarding Analysis and Communication of Trends and Climate Projections*, which will include the analyses as well as guidance for the Cal-Adapt development team on how to work the analyses into Cal-Adapt (e.g., where the links might be placed).
- Active participation in the Technical Advisory Committees for the projects on climate vulnerabilities and adaptation options for the natural gas sector in California funded by Public Interest Energy Research Natural Gas.
- Support natural gas utilities, upon request, to make sure they properly use the data available in Cal-Adapt in future vulnerability and cost of adaptation reports to the Department of Energy. This support will be coordinated through the Energy Commission's staff lead on the Energy Sector Implementation Action Plan and support activities will be summarized in a Technical Memo *Detailing Support to Natural Gas Utilities in Proper Use of Cal-Adapt*.
- Implement improved boundary layer and cloud parameterizations within the Weather Research and Forecasting climate model to improve simulations of low clouds in coastal areas and the Central Valley. Produce Technical Memo *Regarding Improved Simulations of Low Clouds in California's Coastal Areas and Central Valley*.
- Downscale existing 9-km and 3-km resolution data to 90 m over entire State of California using a 90-m resolution soils dataset for historical baseline period (1991–2014). Produce temperature simulations covering 1991–2014 period for the natural gas sector and Technical Memo *Regarding 1991–2014 90-m Temperature Simulations*.
- Downscale existing 9-km and 3-km resolution data to 90 m over entire State of California using a 90-m resolution soils dataset for a future period (2081–2100). Produce temperature projections for the natural gas sector for 5 dynamically downscaled GCMs for the 2081–2100 period under business-as-usual global greenhouse gas emissions and Technical Memo *Regarding 2081–2100 Dynamically Downscaled 90-m Temperature Projections Under Business-As-Usual Emissions*.
- Produce for the natural gas sector statistically downscaled temperature projections at 9-km resolution for remaining GCMs in the Coupled Model Intercomparison Project Phase 5 (CMIP5) archive, for the 2081–2100 period, under business-as-usual greenhouse gas emissions, and Technical Memo *Regarding 2081–2100 Statistically Downscaled 9-km Temperature Projections Under Business-As-Usual Emissions*.
- Produce for the natural gas sector statistically downscaled temperature projections at 9-km resolution for remaining GCMs in the CMIP5 archive, for the 2081–2100 period, under a scenario of reduced global greenhouse gas emissions, and Technical Memo *Regarding 2081–2100 Statistically Downscaled 9-km Temperature Projections Under Emissions-Reduction Scenario*.
- Produce for the natural gas sector statistically downscaled temperature projections at 9-km resolution for all GCMs in the CMIP5 archive, for a 2041–2060 period, under business-as-usual greenhouse gas emissions, and Technical Memo *Regarding 2041–2060 Statistically Downscaled 9-km Temperature Projections Under Business-As-Usual Emissions*.
- Produce for the natural gas sector statistically downscaled temperature projections at 9-km resolution for all GCMs in the CMIP5 archive, for a 2041–2060 period, under a scenario of reduced global greenhouse gas emissions, and Technical Memo *Regarding*

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2041–2060 Statistically Downscaled 9-km Temperature Projections Under Emissions-Reduction Scenario.

Deliverables:

- Memo Summarizing Selection of 10 GCMs by DWR
- Memo Regarding Choice and Use of Selected Scenarios for California's Fourth Climate Change Assessment
- Memo Detailing Differences Between Cal-Adapt 2.0 and the Original 2011 Cal-Adapt
- Memo Regarding the Use of Cal-Adapt by Natural Gas Utilities
- Technical Memo Regarding Analysis and Communication of Trends and Climate Projections
- Technical Memo Detailing Support to Natural Gas Utilities in Proper Use of Cal-Adapt.
- Technical Memo Regarding Improved Simulations of Low Clouds in California's Coastal Areas and Central Valley
- Technical Memo Regarding 1991–2014 90-m Temperature Simulations.
- Technical Memo Regarding 2081–2100 Dynamically Downscaled 90-m Temperature Projections Under Business-As-Usual Emissions
- Technical Memo Regarding 2081–2100 Statistically Downscaled 9-km Temperature Projections Under Business-As-Usual Emissions.
- Technical Memo Regarding 2081–2100 Statistically Downscaled 90-m Temperature Projections Under Emissions-Reduction Scenario
- Technical Memo Regarding 2041–2060 Statistically Downscaled 9-km Temperature Projections Under Business-As-Usual Emissions
- Technical Memo Regarding 2041–2060 Statistically Downscaled 9-km Temperature Projections Under Emissions-Reduction Scenario

Task 6.2 Research Coordination with LGC to Provide Support for Meaningful Stakeholder Engagement.

The goal of this task is to coordinate with the Local Government Commission (LGC), which serves as the coordinator for the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA) to utilize its network of climate change adaptation stakeholders and experts in Southern California. ARCCA is a consortium of local and regional agencies working to advance climate adaptation in their regions. ARCCA is working collectively with state and federal agencies to create a formal partnership that will make the most efficient use of our limited resources and streamline state and regional adaptation assistance to local governments. ARCCA seeks opportunities for on-the-ground state/regional joint initiatives on climate adaptation research, funding, training, and communications, with the great potential to create a long-term partnership around policies and programs that will benefit all Californians.

The Contractor shall:

- Coordinate with ARCCA to utilize its network of climate change adaptation experts.
- Utilize ARCCA connections to key players, resources, to host meetings with stakeholders in their region, and tools to assist the research project.

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- Include ARCCA in the technical advisory committee for this project. ARCCA will actively participate in technical meetings and review and provide comments on draft research products.
- Work with ARCCA in the organization of regional stakeholder meetings. At least three stakeholder meetings will be conducted under this task.
- Work with ARCCA on all stages of the meetings including but not limited to targeting outreach and meeting summaries.
- Prepare technical memorandum *Regional Climate Adaptation Collaboration to Improve Climate Resilience of the Natural Gas System in Southern California: lessons learned* that summarizes this work done under this task.

Deliverables:

- Technical memorandum *Regional Climate Adaptation Collaboration to Improve Climate Resilience of the Natural Gas System in Southern California*.

TASK 7: 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:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.

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- 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 8: 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. 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

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- 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, IRVINE

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 500-15-005 with with the Regents of the University of California, on behalf of the Irvine campus for a \$893,692 contract to investigate climate vulnerability of the natural gas energy infrastructure in Southern California considering concurrent, compounding and dependent climate extremes. This project will support research to prepare for and mitigate the negative effects of climatic change, climate variability and 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]

Cody Goldthrite,
Secretariat