STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015) CALIFORNIA ENERGY COMMISSION

New Agreement EPC-17-028 (To be completed by CGL Office)

ERDD	Yu Hou	43	916-327-1544

Lawrence Berkeley National Laboratory	94-2951741

High Resolution Source Importance Mapping to Minimize Impacts of Waste Biomass Distributed Generation on Ozone Air Quality in Disadvantaged Communities in the San Joaquin Valley

	5/1/2018	3/31/2021	$ 200,000

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

Proposed Business Meeting Date	3/21/2018	☐ Consent	☒ Discussion
Business Meeting Presenter	Yu Hou	Time Needed:	5 minutes

Please select one list serve. EPIC (Electric Program Investment Charge)

Agenda Item Subject and Description

LAWRENCE BERKELEY NATIONAL LABORATORY. Proposed resolution approving Agreement EPC-17-028 with the Department of Energy's Lawrence Berkeley National Laboratory for a $200,000 grant to develop an innovative mapping tool for both local and upwind emission sources that contribute to ozone air pollution in disadvantaged communities to inform decisions regarding locations and technologies of future bioenergy distributed generation in the San Joaquin Valley.

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: Public Resources Code § 21102 and Cal. Code Regs., tit. 14, § 15262.
   ☒ 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 computer modeling approach to estimating ozone concentrations resulting from bioenergy facilities and other pollutant sources may or may not provide guidance to bioenergy facility developers, communities, and decision-makers on where to locate bioenergy facilities in the San Joaquin Valley. However, this work is at most a planning study for possible future actions that no agency, board, or commission has yet approved, adopted, or funded. Under Public Resources Code section 21102 and California Code of Regulations, title 14, section 15262, no EIR or negative declaration is required under these circumstances. Secondly, California Code of Regulations, title 14, section 15306 exempts basic data collection, research, experimental management, and resource evaluation activities that do not result in a serious or major disturbance to an environmental resource. The project consists of data collection and computer modeling to be conducted in existing offices. For these reasons, the proposed project will have no significant effect on the environment and falls within the categorical exemption under section 15306.

   ☐ b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
   Check all that apply
   ☐ Initial Study
   ☐ Negative Declaration
   ☐ Mitigated Negative Declaration
   ☐ Environmental Impact Report
   ☐ Statement of Overriding Considerations

Legal Company Name:	Budget
	$
	$
	$
	$
	$
	$

STATE OF CALIFORNIA

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

Budget Information

Funding Source	Funding Year of Appropriation	Budget List No.	Amount
EPIC	16-17	301.001D	$200,000
			$
			$
			$
			$
			$
R&D Program Area: EGRO: EA		TOTAL:	$200,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				**Recipient's Project Manager**			
Name:	Betsy Quayle			Name:	Ling Jin		
Address:	1 Cyclotron Rd			Address:	1 Cyclotron Road, MS 56A-0120		
City, State, Zip:	Berkeley, CA 94720-8099			City, State, Zip:	Berkeley, CA 94720-8126		
Phone:	510-486-7391 /	Fax:	- -	Phone:	510-495-2177 /	Fax:	- -
E-Mail:	BEQuayle@lbl.gov			E-Mail:	ljin@lbl.gov		

Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-16-311

☐ First Come First Served Solicitation

The following items should be attached to this GRF

1. Exhibit A, Scope of Work		☒ Attached
2. Exhibit B, Budget Detail		☐ Attached
3. CEC 105, Questionnaire for Identifying Conflicts		☐ Attached
4. Recipient Resolution	☒ N/A	☐ Attached
5. CEQA Documentation	☐ N/A	☐ Attached

Agreement Manager	Date	Office Manager	Date	Deputy Director	Date

EXHIBIT A
Scope of Work

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Data preparation and initial model testing
3	1	Model simulations of marginal impacts
4		Spatial heterogeneity assessment, variations, and uncertainties
5		Evaluation of Project Benefits
6		Technology/Knowledge Transfer Activities

Acronym/Term List

Acronym/Term	Meaning
BAAQMD	Bay Area Air Quality Management District
BDG	Waste biomass distributed generation
CAM	Commission agreement manager
CAO	Commission agreement officer
CMAQ	EPA's Community Multiscale Air Quality model
CMAQ_adj	The adjoint of the CMAQ model that attributes ozone changes in a receptor region to all possible individual emission sources
CPR	Critical project review
DAC	Disadvantaged communities
NAAQS	National Ambient Air Quality Standards
NOx	Nitrogen oxides
TAC	Technical advisory committee
SJV	San Joaquin Valley
SJVAPCD	San Joaquin Valley Air Pollution Control District
VOC	Volatile organic compound

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

A. Purpose of Agreement

The purpose of this Agreement is to fund a study that maps both local and upwind emission sources that contribute to ozone air pollution in disadvantaged communities (DAC) and use the source importance mapping to develop site-specific ozone mitigation strategies. The modeling results will be used to highlight new location-specific opportunities for prioritizing new bioenergy siting and emission control targets that cost-effectively minimize air quality impacts from expanding development of biomass distributed generation (BDG).

B. Problem/ Solution Statement

Waste biomass is abundant throughout California, and its conversion to energy contributes to Governor Brown's goal of 12,000 MW of renewable distributed generation and supports the State's goal of diverting 75% of solid waste from landfills by 2020. Waste BDG is incentivized by

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

SB1122, which requires the CPUC to direct investor-owned utilities to procure at least 250 MW of power from new, small biopower projects in a separate feed-in tariff program. Bioenergy is also an option under the Community Choice Aggregation system, which allows local communities to choose alternative energy supplies with “greener” mix. Waste biomass is poised to play a major role in California’s low-carbon future.

The full potential of BDG, however, will not be reached unless the air quality impacts can be minimized, efficiently and affordably. Current bioenergy production generally involves the combustion of biomass or digester gas, which produces air pollutants, primarily nitrous oxides and volatile organic compounds (NOx and VOC), these pollutants react in the atmosphere to form ozone, a persistent air pollutant that exceeds the health-based national standard in many regions of the State. A recent UC Irvine study (Carreras-Sospedra et al. 2015) showed bioenergy production at its full potential under current permitted technologies could greatly exacerbate ozone air pollution in the San Joaquin Valley (SJV), where DAC already suffer from poor air quality. Although the air quality impact from BDG can be mitigated by more advanced technologies and stricter emission controls, across-the-board implementation of these measures can be expensive and inefficient.

Ozone formation is a complex regional problem. The ozone impact on a community can originate from emissions located far outside of the community region (Jin et al. 2008 and 2011). The contribution to ozone pollution at a given downwind location – such as DAC - also vary by source locations depending on wind direction, topography, and the reaction of these emissions with existing pollutants in the atmosphere. With the development of a tool and framework that can identify a specific facility’s regional impacts, location- and case-specific ozone mitigation strategies can be created for deploying BDG in a targeted way that allows widespread deployment while protecting air quality throughout the state.

Solution

The Recipient will focus on the SJV area and conduct a study to quantify the relative importance of individual source locations according to their ozone impacts (quantified by polluting potential) on ozone burdens in DAC and non-attainment areas. The SJV is chosen as it has abundant biomass waste streams and has long been out of compliance with the ozone National Ambient Air Quality Standards (NAAQS) leading to top ranking DAC in the state. Understanding how to mitigate regulatory challenges in to ease pollution burden and ozone attainment given future scaling up of BDG is especially needed for this region.

This study will determine ozone polluting potential of individual project locations by application of high-resolution state-of-art chemical transport modeling coupled with an adjoint tool. The Recipient will perform ensemble simulations `driven by a range of weather conditions and for ozone burden in DAC and ozone attainment goals under current ozone standards. The modeling results will be used to delineate high- and low- impact locations to determine size and emission limit of the BDG projects and guide decisions on optimal BDG siting and emission control targets in a cost-effective and damage-minimizing fashion. The analysis tool and framework developed through this project can be extended in future work to include other criteria pollutants and/or greenhouse gases, other major air basins in California, and future emission years.

EXHIBIT A
Scope of Work

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

(1) quantify the relative importance of individual existing and potential facility locations according to their impacts on ozone levels in the disadvantaged communities and the ability of the SJV to meet federal ozone standards
(2) determine location-dependent emission limits for BDG deployment that are needed to protect the public health of disadvantaged communities and meet federal ozone standards
(3) understand the effects of variable weather conditions on the polluting potential of any given waste biomass facility
(4) provide high-resolution geospatial information on source importance to guide damage-minimizing decisions for BDG siting priorities and technology choices.
(5) develop a new analytical framework to assist planners in reducing the air-quality impacts of increasing the utilization of waste biomass throughout California by strategically siting these facilities

Ratepayer Benefits:[2]

This Agreement will provide valuable new information for stakeholders (policy makers, air quality regulators, and private power developers) regarding the greatest opportunities for efficient and cost-effective minimization of the air quality impacts of BDG. By providing critical new information to help resolve the air quality concerns associated with BDG, this project facilitates the expansion of sustainable utilization of waste biomass to achieve California's energy and environmental goals. The additional distributed renewable power that results from expanded utilization of waste biomass may have substantial long-term benefits for the grid in areas where the availability of waste biomass (crop residues and food processing waste in the SJV, for example) aligns with summer's peak demand for air conditioning. The ultimate result will be a more resilient grid, reduced investments in transmission infrastructure, and reduced fossil carbon emissions.

Technological Advancement and Breakthroughs:[3]

This Agreement will lead to technological advancement and breakthroughs that overcome barriers to using BDG more widely to help achieve the State of California's statutory energy goals. This new modeling tool will produce entirely new information that highlights efficient and cost-effective opportunities to minimize the impacts of BDG. The quantitative estimates of marginal impacts will enable the evaluation of environmental costs and benefits at the planning stages of BDG development or the evaluation of strategies and scenarios without re-running expensive and time-consuming computer simulations. Finally, the results will be used to assess the effects of changing meteorological conditions and will provide scientific bases to reduce uncertainties in decision-making regarding BDG. By tackling challenges in attaining ozone standards, our results should increase the utilization of waste biomass, thereby increasing

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

[3] 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 energy goals.

California's BDG capacity and helping the State meet its Renewable Portfolio Standards, Governor Brown's Clean Energy Jobs Plan, and 2020 goal of 12,000 MW of renewable DG.

Agreement Objectives

The objectives of this Agreement are to:

(1) develop a photochemical transport modeling system, the adjoint of EPA's **C**ommunity **M**ultiscale **A**ir **Q**uality (CMAQ_adj) to perform simulations driven by a range of weather conditions

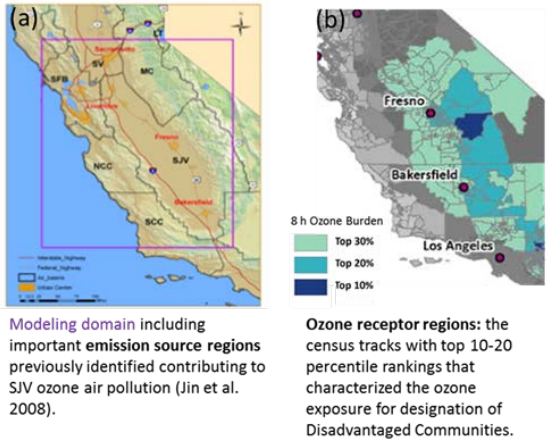
(2) use the photochemical transport modeling system to map potential and existing emissions that influence ozone air quality in disadvantaged communities in SJV (Figure 1). The polluting potentials of the emissions from any locations are simulated by the adjoint of CMAQ which attributes ozone changes in disadvantaged communities to all possible source locations.

(3) similarly, use the photochemical transport modeling system to map emissions that influence ozone air quality in SJV areas out of compliance with current ozone standard.

(4) delineate area of influence and identify changes under various weather conditions

(5) for a given limit to ozone increases, delineate BDG project emission limits throughout the modeling domain.

(6) combine the spatial patterns of the pollutants' impacts and emission limits with other geospatial drivers of BDG deployment (such as waste biomass feed stock types and availability, proximity to electricity grids) to develop a set of location-specific strategies to mitigate BDG's impacts on air quality, including prioritizing siting and selecting conversion technology and utilization options.



Modeling domain including important **emission source regions** previously identified contributing to SJV ozone air pollution (Jin et al. 2008).

Ozone receptor regions: the census tracks with top 10-20 percentile rankings that characterized the ozone exposure for designation of Disadvantaged Communities.

Figure 1. The adjoint of CMAQ maps emissions at 4x4 km grid cell level from the modeling domain (a) according to their polluting potential on disadvantaged communities with highest rankings of ozone burden (b).

EXHIBIT A
Scope of Work

II. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products
The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Submit the final product to the CAM once agreement has been reached on the draft. The CAM will provide written approval of the final product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- If the CAM determines that the final product does not sufficiently incorporate his/her comments, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For products that require a final version only

- Submit the product to the CAM for approval.
- If the CAM determines that the product requires revision, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

    - **Electronic File Format**
      Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the 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 products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format. The Recipient 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.
  - 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 Recipient 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 Recipient 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;
  - Administrative products (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;
- Technical products (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 Project Schedule, 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 Recipient a *Kick-off Meeting Agenda*.

Recipient Products:

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

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

EXHIBIT A
Scope of Work

The Recipient 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 Products* 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 products 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 Recipient's input.
- Send the Recipient 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 Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. 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 Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

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

CAM Products:

- 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 Recipient 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 Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

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

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM 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 products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.

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

Products:

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

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 Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
    - Summarize all Agreement activities conducted by the Recipient for the preceding month, including 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.
    - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.

- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of Funds" section of the terms and conditions. In addition, each invoice must document and verify:
    - Energy Commission funds received by California-based entities;
    - Energy Commission funds spent in California *(if applicable)*; and
    - Match fund expenditures.

Products:
- 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 and approve 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 Recipient must use a Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:
- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

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

CAM Product:
- Style Manual

Subtask 1.6.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Products:
- Final Report (draft and final)

EXHIBIT A
Scope of Work

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds
The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

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

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the 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.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
  - 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.

Products:

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

EXHIBIT A
Scope of Work

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 Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If 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 Recipient will follow in applying for and obtaining the permits.

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

Products:

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

Subtask 1.9 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 Recipient 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).

Products:

- 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 products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.

- 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.

Products:
- 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.

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

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

EXHIBIT A
Scope of Work

III. TECHNICAL TASKS

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

TASK 2. DATA PREPARATION AND INITIAL MODEL TESTING

The goal of this task is to prepare CMAQ-ready input fields and perform initial diagnostic testing and benchmarking of the CMAQ_adj SJV model simulations. Primary model inputs are (1) meteorological fields for four ozone episodes that capture representative historical summer flow regimes in the SJV, as identified in a peer-reviewed LBNL previous study (2) emissions of ozone precursors for a recent model year; and (3) lateral chemical boundary conditions using global model output and initial conditions using a three-day spin-up simulation.

The Recipient shall:

- Prepare model-ready input fields (gridded at 4 km by 4 km horizontal resolution) of meteorological conditions (winds, temperature, pressure, etc.) of four ozone episodes that were identified in previous studies that will capture representative flow regimes in a historical summer season in the SJV modeling domain.
- Prepare model-ready input fields of ozone precursor emissions (4km by 4km horizontal resolution) for a base year for the SJV modeling domain.
- Contact SJV air district to obtain any updates in recent model inputs used for the air district State Implementation Plan for ozone.
- Obtain feedback from the Bay Area Air Quality Management district on model input adequacy based on their previous experiences of CMAQ_adj application.
- Working with SJVAPCD to seek inputs on district's current Modeling Protocol, forecasts and other latest data during initial model testing
- Conduct initial CMAQ_adj simulations for a five-day ozone episode and benchmark model performance.
- Prepare *Modeling Protocol* that shall include, but not be limited to:
    - documents the SJV domain,
    - horizontal and vertical resolution, and
    - meteorological and emission inputs.

Products:

- Modeling Protocol

TASK 3. MODEL SIMULATIONS: ATTRIBUTING OZONE IMPACTS TO SOURCE LOCATIONS

The goal of this task is to attribute ozone impacts to source locations by 1) define two ozone impact metrics, and 2) conduct ensemble of simulations using CMAQ_adj model.

The Recipient shall:

- Define metrics for evaluating impacts on ozone and meeting ozone standards
    - Derive ozone concentration fields by running the CMAQ model in a forward mode driven by the model-ready meteorological and emission fields
    - Define ozone impact metrics:

    - An ozone burden metric for disadvantaged communities defined by CalEnviroScreen 3.0 with the highest ozone burdens (top 10-20 percentiles).
    - Impact metrics based on the SJV's ability to meet ozone standards according to the simulated 8-h average ozone maxima exceeding the 70 ppb federal standards.
- Determine contributions to the ozone impact metrics from individual grid-cells (4 km by 4 km) throughout the modeling domain by running the CMAQ_adj model in backward mode, attributing changes in the impact metrics "backward" to a unit change in source emissions of NOx and VOCs, separately in each grid-cell. The resulting quantity computed by CMAQ_adj at any given grid-cell represents its polluting potential: changes in ozone impact (defined by ozone impact metrics) per unit addition of ozone precursor emissions at that location.
- Simulations will be conducted for the eight combinatorial of the following cases:
    - four meteorological regimes
    - two impact metrics
- Participate in the first CPR meeting as described in TASK 1.3 as well as prepare and provide *CPR Report I*
- Prepare *Ozone Impact Metrics and Ensemble Simulation Report* that shall include, but not be limited to: definitions of two impacts metrics, and simulation results of eight combinations of four meteorological regimes and two impact metrics.

Products:

- Ozone Impact Metrics and Ensemble Simulation Report (Draft and Final)

TASK 4. SPATIAL HETEROGENEITY IN SOURCE IMPORTANCE WITH AN APPLICATION TO BDG SITING

The goal of this task is to characterize the geospatial variations in the importance of facility locations based on their polluting potential in the DAC and in areas out of compliance with ozone standard.

The Recipient shall:

- Characterize the geospatial variations in polluting potential from ozone-forming precursor emissions of NOx and VOCs throughout the SJV
    - Examine the sign and magnitude of the simulated marginal impacts from NOx and VOCs for individual modeling cases and delineate areas of influence and the importance of low and high pollutant sources
    - Compare the spatial variation at 4 km by 4 km resolution to traditional source apportionment studies performed in a spatially aggregated manner at air basin or sub-air basin scales
- Compare and contrast the spatial patterns by examining the magnitude of similarities and differences within and across the simulations of the polluting potentials for:
    - NOx versus VOCs
    - Different meteorological conditions
    - Different impact metrics (meeting federal ozone standard vs. protecting disadvantaged communities)
- For a given <1 ppb increase in ozone responses at non-attainment areas or disadvantaged communities, determine the emission limits at individual source locations

- Compare the magnitude of changes in marginal impacts quantified from the above analysis to derive the most influential factors that govern the geospatial variations
- Combine the model results with the life-cycle emissions inventory of BDG to recommend location-specific development strategies in a case-study form
    - Focus on areas having facilities and areas having abundant waste biomass streams for potential new BDG
    - Examine the candidate BDG locations, a suitable set of conversion technologies, and demand-driven biopower utilization options, in a case study form, provide location-specific recommendations based on our modeled marginal impacts, including but not limited to:
        - Avoiding siting at high-impact locations
        - Prioritizing low-emission technologies and emission controls in high-impact locations
        - Choosing biopower utilization options that are able to displace existing emissions (such as from a central in-state power plant or a local diesel generator) at more impactful locations
    - Quantify the differences in the impact on ozone burdens by calculating total impact according to following equation under alternative strategies:
        - Total impact = sum of (ozone impacts per unit emission x the actual emissions) at individual facility locations
- .Prepare *Spatial Heterogeneity Case-Study Report* that shall include, but not be limited to the results of all activities performed in TASK 4.
- Prepare *Sources Maps* at 4 km by 4 km horizontal resolution; including quantification of polluting potential of ozone-forming emissions and source importance mapping throughout the SJV from ensemble model simulations

Products:

- Spatial Heterogeneity Case-Study Report (Draft and Final)
- Sources Maps

TASK 5. EVALUATION OF PROJECT BENEFITS

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

The Recipient 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:

    - <u>For Product Development Projects and Project Demonstrations:</u>
        - 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.
    - 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.

o 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 have 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 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.

- Respond to CAM questions regarding responses to the questionnaires.

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

Products:

- 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 Recipient 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 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 on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 18-0321-4b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: LAWRENCE BERKELEY NATIONAL LABORATORY

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 EPC-17-028 from GFO-16-311 with the Department of Energy's Lawrence Berkeley National Laboratory for a $200,000 grant to develop an innovative mapping tool for both local and upwind emission sources that contribute to ozone air pollution in disadvantaged communities to inform decisions regarding locations and technologies of future bioenergy distributed generation in the San Joaquin Valley; 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 March 21, 2018.

AYE: [List of Commissioners]
NAY: [List of Commissioners]
ABSENT: [List of Commissioners]
ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat