STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 12/2019) CALIFORNIA ENERGY COMMISSION

A) New Agreement # EPC-21-038 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Mithra Moezzi		916-891-8619

C) Recipient's Legal Name	Federal ID Number
Eagle Rock Analytics	47-2746064

D) Title of Project
Climate-Informed Energy Sector Adaptation Planning Web Application via Cal-Adapt

E) Term and Amount

Start Date	End Date	Amount
7/6/2022	3/31/2025	$ 750,000

F) Business Meeting Information

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

Proposed Business Meeting Date 6/8/2022 ☐ Consent ☒ Discussion

Business Meeting Presenter Alex Kovalick Time Needed: 5 minutes

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

Agenda Item Subject and Description:

Eagle Rock Analytics. Proposed resolution approving Agreement EPC-21-038 with Eagle Rock Analytics for a $750,000 grant to enhance the Cal-Adapt web application to accommodate an increase in volume of climate-related data produced through EPIC initiatives; develop and execute new stakeholder-informed scientifically rigorous climate visualizations and tools; and adopting staff's determination that this action is exempt from CEQA. The effort will advance California's electricity sector's capacity to incorporate climate into investments, planning, and rulemaking, including supporting California's Fifth Climate Change Assessment. (EPIC funding) Presenter: Alex Kovalick (Staff Presentation: 5 minutes)

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":

2. If Agreement is considered a "Project" under CEQA:
   a) ☒ Agreement **IS** exempt.
      ☐ Statutory Exemption. List PRC and/or CCR section number:
      ☒ Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15306
      ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section:

The activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.

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

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

Legal Company Name:	**Budget**
The Regents of the University of California, Berkeley	$ 508,293
Naomi Goldenson	$ 25,000
TBD - Outreach	$ 20,000
	$

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

Legal Company Name:

J) Budget Information

Funding Source	**Funding Year of Appropriation**	**Budget List Number**	**Amount**
EPIC	21-22	301.001I	$750,000
			$

R&D Program Area: EGRO: EA TOTAL: $ 750,000

Explanation for “Other” selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Owen Doherty
Address: 3669 57th St
City, State, Zip: Sacramento, CA 95820-2352
Phone: 916-936-0199
E-Mail: owen@eaglerockanalytics.com

2. Recipient's Project Manager

Name: Mark Koenig
Address: 3669 57th St
City, State, Zip: Sacramento, CA 95820-2352
Phone: 916-844-8403
E-Mail: mark.koenig@eaglerockanalytics.com

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-21-302
☐ First Come First Served Solicitation Solicitation #:
☐ Non-Competitive Bid Follow-on Funding (SB 115)

M) 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

I. TASK ACRYONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		A Co-Produced, Agile-Managed Development Plan for the Visualization and Tool Development on Cal-Adapt
3		Executing the CEC's Vision for the Cal-Adapt Enterprise
4	X	Visualizations and Tools in Support of a Transition to a Zero-Carbon Grid
5		Cal-Adapt as a Climate Data Service (Outreach & Training)
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
API	Application Programming Interface
AWS	Amazon Web Services
Cal-Adapt	cal-adapt.org website
Cal-Adapt 2.0	Current version of Cal-Adapt we intend to replace
Cal-Adapt: Analytics Engine	Cloud based data repository and computational environment which allow users access to tools and capacity to process climate data
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CMIP5	Coupled Model Intercomparison Project v5
CMIP6	Coupled Model Intercomparison Project v6
CEC	California Energy Commission
CPR	Critical Project Review
CPUC	California Public Utilities Commission
EPIC, EPC	Electric Program Investment Charge
GCM	Global Climate Model
Group 1	Group 1 of GFO-21-302
Group 2	Group 2 of GFO-21-302
IOU	Investor-Owned Utilities
IRB	Institutional Review Board
Jupyter	A web-based interactive computing platform combines live code, equations, narrative text, visualizations
OPR	Governor's Office of Planning and Research
Recipient	Eagle Rock Analytics
S3	Cloud object storage with high data availability, security, and performance
TAC	Technical Advisory Committee

[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.

Exhibit A
Scope of Work

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

A. Purpose of Agreement

The purpose of this Agreement is to fund work which advances the California electricity sector's capacity to incorporate climate into investments, planning, and rulemaking by producing climate-informed informatics and visuals for localized, high-resolution, next-generation climate projections.

B. Problem/Solution Statement

Problem

While the electricity sector's awareness of climate change is increasing, the use of climate data in the regulating of, planning for, and investment into, state and investor-owned utilities (IOU), remains limited. Slow adoption of climate information is a combination of human inertia, a lack of climate-informed capacity, and technological barriers. Developing new visualizations and tools which address these challenges directly, crafted with the philosophy of increasing capacity for utilization of climate-informed products, is critically needed. Between approaching statutory goals (i.e., Senate Bill (SB) 100 and SB 423), new regulatory frameworks (i.e., California Public Utilities Commission (CPUC) Decisions 18-04-019 and 19-10-054) and the current production of next-generation climate data (i.e., California's Fifth Climate Assessment) the need for this effort is urgent.

The amount of data needed to run the Cal-Adapt Application Programming Interface (API) has increased from 10TB to 2500TB, rendering the current computer architecture which runs visualizations insufficient to support the next generation of data. As the Cal-Adapt Enterprise has expanded, so has the complexity of the data stored, necessitating new pathways for users to access the data remotely. Recently developed components of Cal-Adapt (Analytics Engine, EPC-20-007) exist within a different computational environment, creating a barrier between portions of the Cal-Adapt enterprise. Critically, a re-development of the underlying data and computer architecture is needed to power visualizations and tools that incorporate the next-generation, high-resolution climate data that underpins the State of California's climate agenda.

Solution

The Recipient must evolve stakeholder engagement and user guidance to focus on building the capacity of end users to use climate data. The Recipient will rely on co-production to jointly develop work plans with users, stakeholders, California Energy Commission (CEC) staff, scientists, and Recipient's development team. Co-production will ensure that the tools and visualizations developed are usable and actionable for stakeholders, and that they support the State's statutory goals around climate and clean energy. Co-produced work plans will be executed by an Agile management team, that will focus on increasing tool and visualization efficiency, while ensuring the project philosophy remains focused on building capacity of end users. The Recipient's training and guidance effort will shift focus from supporting new tools, to supporting the growth and capacity of end users. The Recipient will couple training efforts led by its development team with education and outreach performed by climate and social scientists- a combination which will improve the capacity of the electricity sector to utilize climate information.

The Recipient will adopt new technological solutions to serve an expanded database and structure and develop new stakeholder informed visualizations and tools. A new API will be developed to serve data and empower tools, which will connect to a new integrated data catalog to be shared with the Cal-Adapt Analytics Engine. The next-generation of climate-informed tools and visualizations will be built, including novel visualization of zero-carbon resource potential

and a map viewer platform that will deliver a wide range of climate visualizations. Through collaboration with the Analytics Engine these new tools will be enhanced with new statistical and scientific capabilities, and in turn the Analytics Engine will benefit from improved visualizations. Collectively this will address California's electricity sector's capacity to incorporate climate information and take advantage of the massive advances in recent climate modeling efforts.

C. Goals and Objectives

Agreement Goals

The goals of this Agreement are to:

- Enhance Cal-Adapt's interactive web application to provide access—through easy-to-use data download tools and interactive visualizations—to the climate projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for vulnerability assessments and planning by IOUs.
- Enhance Cal-Adapt's interactive web application to provide access to data and interactive visualizations portraying projected changes in the temporal and spatial distributions of zero-carbon electricity generation resources investigated by Group 2.
- Update the Cal-Adapt web platform with energy-related products from complementary initiatives, including the EPIC projects on "A Co-Produced Climate Data and Analytics Platform to Support California's Electricity Resilience Investments" (EPC-20-007) and "Comprehensive Open Source Development of Next Generation Wildfire Models for Grid Resiliency" (EPC-18-026).

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of enhanced reliability of the electricity grid and lower costs by:

Identifying new extreme and/or compounding climate events which would impact reliability of the electricity grid, thus enabling better planning to withstand these events, in turn increasing reliability of the electricity grid. This work will advance California's capacity to deploy new zero-carbon generation capacity in a climate-informed manner, reducing costs for ratepayers.

Technological Advancement and Breakthroughs: This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by:
Providing user access to the massive new climate dataset currently being developed by EPIC recipients by transitioning to a new and more powerful web API alongside integrated data visualization and download tools. These tools will allow Cal-Adapt to fetch and serve data from the Cal-Adapt: Analytics Engine framework using analysis-ready cloud optimized data formats stored in cloud object storage with high data availability, security, and performance (S3) buckets. By building on the Analytics Engine computational and data architecture, we can achieve parallel performance and exceed the input/output boundaries that currently limit Cal-Adapt. To reduce cost to ratepayers, we will adopt the data storage approach utilized in the Cal-Adapt: Analytics Engine, which leverages significantly less expensive Amazon Web Services S3 storage and distributed processing. This approach provides unprecedented computational and technical resources by providing access to Fifth Assessment Coupled Model Intercomparison Project

[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).

Phase 6 (CMIP6) climate data through a computing sandbox that allows users to harness the power of the cloud to process and interact with climate data, in turn directly supporting California's energy resilience.

This agreement will further the development of the next-generation web API and a select number of new data visualizations and tools that will be accessible from the Cal-Adapt web application. Development of new data visualizations will occur in coordination with the Cal-Adapt: Analytics Engine, allowing for the new tools to incorporate and take advantage of the scientifically rigorous data analyses being developed. New tools will directly link to scripts and Jupyter notebooks on the Cal-Adapt Analytics Engine that fully document the process for creating climate outputs (including the steps involved to access and process data and code to transform or calculate indices as required) thus ensuring reproducibility and reusability of the results for users that need more customized analysis. All new guided visualizations or tools designed and planned under this project would be co-produced in close collaboration with our stakeholders and scientific leadership to ensure that we are building with end users in mind.

Agreement Objectives

The objectives of this Agreement are to:

- Increase the capacity of California's regulators and IOUs to make climate-informed decisions and investments.
- Co-produce tools and visualizations with data creators, technical staff, scientists, and stakeholders to ensure that the development of these tools and visualizations is in direct response to stakeholder needs, is actionable and useful, and builds on novel scientific and technological innovation.
- Streamline tool and visualization development through incorporation of Agile project management.
- Create visualizations and tools which will be used by regulators to develop climate-informed regulations and policy, as well as by industry to make climate-informed investments and plans to build a more climate-resilient electricity grid.
- Coordinate closely with the Group 2 research team and incorporate the findings made available by that research effort.
- Advance the capacity to develop and execute scientifically rigorous data analyses and visualizations on Cal-Adapt, based on the research products of Group 2 and other relevant efforts.
- Coordinate closely with the research team that is funded by EPC-20-007 and to ensure that the products of this (Group 3) effort conform to the overall vision, data architecture, and branding of the data platform and analytics engine effort under development through EPC-20-007, which is foundational to the expanded Cal-Adapt enterprise.
- Develop new tools and visualizations which utilize statistical and scientific developments from EPC-20-007, while in turn providing EPC-20-007 with examples of more advanced visualizations.
- Transition the database on which Cal-Adapt 2.0 currently operates to the database currently under development on the Cal-Adapt Analytics Engine to reduce data storage costs for ratepayers, and for incorporation of their Jupyter notebooks and toolkits.

- Coordinate closely with the research team that is funded by EPC-18-026 "Comprehensive Open-Source Development of Next Generation Wildfire Models for Grid Resiliency" to ensure our efforts to visualize climate are complementary to their efforts to visualize wildfire.
- Maintain critical functionality of the older generation of Cal-Adapt as we transition to the next generation of climate data and develop a new computational architecture and data framework.
- Depreciate and retire older data and functionalities of Cal-Adapt which are no longer a priority for the CEC.
- Ensure that components of Cal-Adapt are severable in structure, so that they can be supported by multiple state agencies, while ensuring that components can communicate and be connected through shared data and methods, including externally maintained data lakes.
- Create a seamless user experience across multiple components of the Cal-Adapt Enterprise through development of a common website. Ensure transfer of front-end capacity to efforts funded by the Governor's Office of Planning and Research (OPR) in the near term.
- Respond to Cal-Adapt's new Governance Plan by streamlining project management across components of the expanded Cal-Adapt Enterprise.

III. 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).** All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations**.** All technical tasks should include product(s). 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:

<u>For products that require a draft version, including the Final Report Outline and Final Report</u>

- 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.
- 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 product.

- Submit the revised product 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.

For products that require a final version only

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

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 California Energy Commission's (CEC) 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.

  The following describes the accepted formats for electronic data and documents provided to the CEC 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.
  - 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 CEC'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 CEC 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;
  - Invoicing and auditing procedures;
  - 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 (subtask 1.5);
  - Final Report (subtask 1.6);
  - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
  - Any other relevant topics.

- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e., project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy

- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, 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:

- Kick-off Meeting Presentation
- Updated Project Schedule *(if applicable)*
- Match Funds Status Letter (subtask 1.7) *(if applicable)*

- Permit Status Letter (subtask 1.8) *(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 CEC 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 CEC 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 CEC.

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 CEC, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare and submit 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.
- 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* with 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)

CAM Products:

- CPR Agenda(s)
- 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 CEC 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 procured equipment.
    - The CEC'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 copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

Products:

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

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 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 Funds and in-state 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. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC 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 *Energy Commission Style Manual* provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Energy Commission Style Manual
- Comments on Draft Final Report Outline
- Acceptance of Final Report Outline

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)
    - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
    - Executive summary (**required**)
    - Body of the report (**required**)
    - References (if applicable)
    - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
    - Bibliography (if applicable)

        - Appendices (if applicable) (Create a separate volume if very large.)
        - Attachments (if applicable)
    - Submit a draft of the Executive Summary to the TAC for review and comment.
    - Develop and submit a *Summary of TAC Comments* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
        - Comments the recipient proposes to incorporate.
        - Comments the recipient does propose to incorporate and an explanation for why.
    - 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.
    - Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
    - Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments
- Draft Final Report
- Written Responses to Comments *(if applicable)*
- Final Report

CAM Product:

- Written Comments on the Draft Final Report

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
    - Ensure that the report includes the following items, in the following order:
        - Cover page (**required**)
        - Credits page on the reverse side of cover with legal disclaimer (**required**)
        - Acknowledgements page (optional)
        - Preface (**required**)
        - Abstract, keywords, and citation page (**required**)
        - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
        - Executive summary (**required**)
        - Body of the report (**required**)
        - References (if applicable)
        - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
        - Bibliography (if applicable)
        - Appendices (if applicable) (Create a separate volume if very large.)
        - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.

- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
  - Comments the recipient proposes to incorporate.
  - Comments the recipient does propose to incorporate and an explanation for why.
- 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.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments
- Draft Final Report
- Written Responses to Comments *(if applicable)*
- Final Report

CAM Product:

- 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 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 CEC 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 CEC 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 CEC 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.
    - If different from the solicitation application, provide 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)*

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 <u>no permits</u> 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 each 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.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.

- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

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.

The TAC shall:

- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.
- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan.

Products:

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

Subtask 1.12 Project Performance Metrics

The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:

- Complete and submit the project performance metrics from the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:

  - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
  - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. 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: A CO-PRODUCED, AGILE-MANAGED DEVELOPMENT PLAN FOR THE VISUALIZATION AND TOOL DEVELOPMENT ON CAL-ADAPT

The goals of this task are to (1) fuse visualization development with stakeholder and policymaker requirements, supported by Agile project management which allows for the project to nimbly respond to articulated needs and (2) co-produce stakeholder-informed development plans which provide technical guidance and goals for the development team to execute tool development around.

Subtask 2.1 Stakeholder Engagement Through Co-Production

The goals of this subtask are to (1) leverage and build upon learnings from the ongoing stakeholder engagement process for the Cal-Adapt Analytics Engine that the Eagle Rock Analytics team is leading (under EPC-20-007), (2) iteratively engage with and co-produce a Visualization Requirement Plan and refine select visualization features with stakeholders, (3) leverage the legitimacy and confidentiality provided by using Institutional Review Board (IRB) protocols while enabling transparency when appropriate, and (4) use stakeholder engagement approaches that enable engagement with regulators, regulated entities, and other stakeholders both individually and collectively.

The Recipient shall:

- Leverage and build upon insights from ongoing stakeholder engagement for Cal-Adapt Analytics engine including:
  - Building upon stakeholder maps developed through ongoing stakeholder engagements for Cal-Adapt and the Cal-Adapt Analytics Engine, and through consultation with CEC, establish a *Visualization Stakeholder Map* which would be an initial list of key agencies and potential stakeholders to engage.
  - Review use-cases developed for the Cal-Adapt Analytics Engine as a starting point for developing an initial set of visualization requirements.
- Convene a Visualization Working Group composed of electricity sector stakeholders, scientific and technical staff from this and affiliated projects, and CEC staff.

  - Conduct an initial Working Group meeting to clearly define the purpose of the group, review potential visualization tools, and solicit stakeholder needs and priorities for development of the Visualization Requirements Plan.
  - Identify a tractable subset of visualization tools of highest priority and value to stakeholders and to the CEC.
  - Hold regular working groups meetings to iteratively identify and refine critically required features of the visualizations as results and demonstrations become available.
  - Share anonymized and de-identified synthesis of working groups with stakeholders, project team and CEC.
- Co-produce a *Visualization Requirements Plan* which will serve to guide the tool development process by:
  - Engaging climate scientists early to understand data availability, constraints and best practices and data constraints.
  - Co-producing the *Draft Visualization Requirement Plan* with stakeholders, project team and CEC representatives.
  - Having climate scientists review the *Draft Visualization Requirement Plan* for consistency with best practices.
  - Writing the Final Visualization Requirement Plan.
- Increase the transparency of the co-production engagement model through thoughtful and appropriate use of IRB protocols:
  - Within IRB consent process, enable stakeholders to opt to publicly share their names and affiliations as participants in any of the engagements (interviews, working groups, etc.) in order to increase transparency regarding who is participating in the engagement process while maintaining a degree of confidentiality by not linking names to specific statements or positions.
  - Rely on focus group discussions within the Working Group as the primary mode of engagement since these facilitate communication among all interested parties within the group.
  - When working groups are not appropriate or sufficient, conduct anonymous interviews in a limited fashion e.g., when stakeholders request a higher level of confidentiality due to subject matter sensitivity or to avoid conflicts of interest that may arise from interactions among regulated and regulating entities or to protect the individuals involved.
  - Be very specific about which meetings or discussions will or will not be covered by IRB protocols beforehand to reduce any confusion and increase transparency.
  - Evolve the co-production process where regulated entities and regulators can independently and collectively contribute to stakeholder engagement process.

Products:

- Visualization Stakeholder Map
- Visualization Requirement Plan (draft and final)

Subtask 2.2 Integration into the Larger CEC Portfolio of Research

The goals of this subtask are to (1) provide well-resourced, expert project management to increase efficiency of the visualization and tool development processes; to (2) shield the development team from unproductive churn in requests and expectations to allow for a shorter cycle time for developing tools and visualizations; (3) prioritize stakeholder requests with CEC to have an ordered list of upcoming priorities and ensure design documentation exists for the upcoming tools; (4) to ensure cloud-computing resources are appropriately tracked and

communicated to CEC and; (5) provide the human connection and relationships needed to connect Cal-Adapt with other ongoing research efforts, and in turn maximize the ratepayer benefits of this and additional CEC funded research efforts.

The Recipient shall:

- Provide professional project management to increase efficiency of the visualization and tool development processes by:
  - Working with the engagement team, stakeholders, and developers as appropriate to define expectations for the upcoming tools / visualizations.
  - Co-producing the *Draft Visualization Requirement Plan* (Subtask 2.1), and using it for project management:
    - Track iterations of features;
    - Focus on efficient internal process flow and external approvals (CAM); and
    - Ensure code is tested and validated.
  - Ensuring feedback on tools is acted upon by development team.
  - Capturing enhancements requested, prioritized alongside other requests.
- Reduce visualization and tool development time by:
  - Minimizing unproductive work, by creating clear opportunities for stakeholders and CEC to advise on visualization/tool requirements before any development time occurs.
  - Utilizing Agile principles to lead the development team by breaking down the work into small incremental deliverables that can be demonstrated to the CAM.
- Prioritize stakeholder requests with CEC by:
  - Developing and maintaining a prioritized list of visualizations that are desired.
  - Ensuring design documentation exists for the upcoming tools.
  - Reviewing priorities with CAM during bi-weekly meetings, and update.
- Ensure cloud-computing resources are appropriately tracked and communicated to CEC by:
  - Providing usage and project risks updates at bi-weekly meetings.
  - Periodically revising usage goals and project schedules in response to externalities (i.e., anticipated transfer to OPR).
  - Managing resources with the goal of providing computational resources across the Agreement length.
- Provide the human connection and relationships needed to connect Cal-Adapt with other ongoing research efforts:
  - Ensure that this project and the larger Cal-Adapt Enterprise are well-coordinated.
  - Coordinate with a variety of connected stakeholders and researchers including, but not limited to the Projections team (EPC-20-006), Groups 1 and 2, CEC, IOUs, and other state agencies identified by CAM.
  - Convey outputs of the connected stakeholders and researchers to the development team to make findings available via the Cal-Adapt web application.
  - Intentionally approach communication, expectations, and dependencies through structuring our communications to be short, frequent, and focused on outcomes, with a small audience to touchpoint on ongoing research without wasting time in long meetings.
  - Develop a *Coordination Log* and provide updates at bi-weekly meetings to appraise CAM of external interactions.
  - Proactively support development and implementation of any CEC-organized cross-product sessions (i.e., Climate Data and Analysis Working Group).

Products:

- Coordination Log

TASK 3: EXECUTING THE CEC'S VISION FOR THE CAL-ADAPT ENTERPRISE

The goal of this task is to build the computational architecture and data framework to execute CEC's new vision for the expanded Cal-Adapt Enterprise. Goals for this task include: (1) providing a seamless user experience across multiple components of Cal-Adapt, (2) supporting a unified web presence for the Cal-Adapt Enterprise, (3) maintaining severability of Cal-Adapt components for multiple funding agencies, and (4) ensuring that the climate and wildfire projections used for California's Fifth Climate Change Assessment are accessible.

Subtask 3.1 Development and Integration of Cal-Adapt Components

The goal of this subtask is to develop the next-generation web API which connects tools, visualizations and data currently being developed to support California's Fifth Climate Change Assessment and the Cal-Adapt: Analytics Engine, in a way that allows for tool development and data access to support a seamless user experience.

The Recipient shall:

- Design and develop the *Next Generation Web API*:
    - Design standards and requirements for the *Next Generation Web API* will be co-produced with stakeholders and CAM (Subtask 2.1).
    - Develop a more modern Python framework designed for API development based on open standards and specifications. The API will include features such as asynchronous input/output, and interactive, automatic documentation generation.
    - Build new baseline API from the selected modern Python framework.
    - Provide programmatic access to the Intake-based Cal-Adapt: Analytics Engine Data Catalog for spatial subsetting, temporal resampling of cloud based geospatial datasets, and serialization to other formats commonly requested by stakeholders.
    - Connect tool development (Task 4) to the computer language and data architecture used in EPC-20-007, allowing for tighter coordination and sharing of progress between this project and EPC-20-007 (i.e., building the capacity to develop and execute scientifically rigorous data analyses and visualizations based on the research products of Group 2 and EPC-20-007).
    - Utilize serverless functions via AWS and S3 object storage for parallel computation and caching of summary results.
    - Optimize performance when querying multiple Global Climate Models (GCM) over large spatial extents by parallelizing reading from multiple input GCMs simultaneously.
    - Provide access—via the *Next Generation Web API*—to the climate and wildfire projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for IOUs vulnerability assessments and planning and are stored on AWS via EPC-20-007.

- Supports CEC's vision for an expanded Cal-Adapt Enterprise by:
  - Ensuring a seamless user experience by developing a *Next Generation Web API* that connects to data objects created by other EPIC projects (i.e., EPC-20-007) and future components of the Cal-Adapt Enterprise which adopt similar data storage architecture.
  - Linking to externally maintained cloud-based data-lakes maintained by other state agencies.

Products:

- Next Generation Web API

Subtask 3.2 Unified Web Presence for the Expanded Cal-Adapt Enterprise

The goal of this subtask is to build on and maintain the Cal-Adapt.org website that conforms to the vision, data architecture and branding of the data platform and analytics engine effort under development through EPC-20-007 in a manner that is seamless for users and maintains component independence for aspects of the Cal-Adapt enterprise developed by separate state agencies.

The Recipient shall:

- Develop a new connected *Data Catalog*, to be documented in a *Memorandum on the Data Catalog*, which:
  - Connects new tools and visualizations developed in Task 4 with the data developed for California's Fifth Climate Change Assessment, Group 2 and stored in AWS S3 storage via the Cal-Adapt Analytics Engine (EPC-20-007).
  - Utilizes cloud-based data formatting of data products stored on AWS S3 storage (by EPC-20-007), which is less costly than current data storage usages, but will be faster to access than current data storage formatting, allowing tools to continue to be interactive and responsive.
  - Allows for incorporation of data that supported California's Fourth Climate Change Assessment, based on stakeholder requirements (Subtask 2.1).
- Design and develop a new *Data Download Tool* which:
  - Designs standards and requirements for the *Data Download Tool* will be co-produced with stakeholders and CAM (Subtask 2.1).
  - Provides access—through easy-to-use data download tools—to the climate and wildfire projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for IOUs vulnerability assessments and planning and are stored on AWS via EPC-20-007.
  - Allows users to access data across components of the expanded Cal-Adapt Enterprise.
- Maintain current capacity and features of Cal-Adapt (2.0):
  - Maintain existing code base during this project until it is transferred or replaced, to provide continuity for Cal-Adapt's many users.
  - Provide bug fixes and update underlying libraries as necessary to support standard operations.
  - Continue to host Fourth Assessment and other climate and weather data currently on Cal-Adapt on AWS.
  - Perform the duties contained in the previous items in this subtask until the state transitions the website to another agency OR decides to retire the previous version of data (Coupled Model Intercomparison Project v5 (CMIP5)/ California's

Fourth Climate Change Assessment) OR a period of 12 months, whichever comes first.
    - Develop a plan for CEC to transition older tools and archive older data:
        - Develop recommendations for longer-term planning for California's climate data shared via a *Memorandum on Recommendations for Long-Term Storage of Legacy Climate Data.*
        - Propose an approach for storing legacy CMIP5 generation data, (i.e., primary datasets such as LOCA and Livneh climate projections and the suite of derived data (such as climate indicators, etc.)) in more cost-efficient cloud storage or on local physical servers as appropriate.
        - Identify previously developed tools which are still of use to stakeholders and develop a roadmap to reimplement those tools in support of California's Fifth Climate Change Assessment.

- Develop website support for the expanded Cal-Adapt Enterprise on the *Cal-Adapt.org Website*:
    - Ensure that users enjoy a seamless experience across components of the expanded Cal-Adapt Enterprise.
    - Prepare the website for transition to a new funding agency.
    - Establish web-presence for the Cal-Adapt Analytics Engine (EPC-20-007):
        - Establish a web-presence as subdomain or part of homepage.
        - Host content generated by EPC-20-007 team.
        - Update web periodically with new content.
        - Create landing pages for linking to tools and visualizations developed by EPC-20-007 as hosted, cloud-based widgets or applications.
        - Provide public access to *Cal-Adapt.org* through end of this agreement, OR transfer to another state agency OR a period of 18 months, whichever comes first.

Products:

- Data Download Tool
- Memorandum on the Data Catalog
- Memorandum on Recommendations for Long-Term Storage of Legacy Climate Data
- Cal-Adapt.org Website

TASK 4: VISUALIZATIONS AND TOOLS IN SUPPORT OF A TRANSITION TO A ZERO-CARBON GRID

The goal of this task is to develop visualizations and tools that develop the capacity of policy-makers to make climate-informed investment and resilience decisions enabling a transition to a zero-carbon grid by: (1) enabling users to understand the impacts to California of the newest generation of climate models (i.e., CMIP6), (2) portraying projected changes in the temporal and spatial distributions of zero-carbon electricity generation resources investigated by Group 2 and (3) creating easy-to-use interactive visualizations of the climate and wildfire projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for IOUs vulnerability assessments and planning.

Subtask 4.1: Easy-to-use Interactive Visualizations of the Climate and Wildfire Projections for California's Fifth Climate Change Assessment

The goal of this task is to create easy-to-use interactive visualizations of the climate and wildfire projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for IOUs' vulnerability assessments and planning.

The Recipient shall:

- Co-produce requirements and development plans for a *Visualization(s) of Climate and Wildfire Projections* with stakeholders and CAM (Subtask 2.1).
- Identify priority climate variables and features required to address stakeholder needs. Explore options for data visualizations with working groups (Subtask 2.1) to determine what best meets the needs of energy sector to develop *Visualization(s) of Climate and Wildfire Projections,* weighing the following considerations:
    - Review usage on Cal-Adapt 2.0 tools to create an initial list of suggested tools to be built ahead of the development plan and stakeholder engagement via the working group (Subtask 2.1). Ensure that this initial list is aligned with state priorities through engagement with CAM.
    - While key features of data visualization and tool requirements will be determined during working group meetings and our stakeholder engagement, one option is to provide fast and responsive data visualizations of Fifth Assessment climate and wildfire projects through a new interactive Map Viewer.
        - The Map Viewer could facilitate exploration of Fifth Assessment climate variables and derived climate indices by different time periods and scenarios and/or by different global warming levels. A map viewer could present past and projected changes to annual and monthly values of key climate variables from the downscaled CMIP6 data and selected climate indices developed by the Cal-Adapt AE platform indexed to a common reference grid & selected boundary layers (e.g., counties and census tracts).
    - Engage EPC-18-026 project team and CAM to align on a vision for what visualizations would exist on Cal-Adapt.org versus Pyregence.org.
    - Depending on stakeholder needs, wildfire projections hosted on Cal-Adapt: Analytics Engine as part of "Comprehensive Open Source Development of Next Generation Wildfire Models for Grid Resiliency" (EPC-18-026) could be included within a general Map Viewer tool or built within a stand-alone wildfire projections tool. Through co-production, the recipient will identify a manageable subset of wildfire products to visualize on the web application, taking care not to duplicate the research and data viewer already funded under EPC-18-026. Identifying where the easy-to-use interactivity of the Cal-Adapt web application can add value to this ongoing research will be important for leveraging state funding and resources.
- Leverage advances of EPC-20-007 through:
    - Providing EPC-20-007 with Python visualization code for incorporation into their Jupyter Notebooks.
    - Use advanced analytics and statistics from EPC-20-007 Jupyter Notebooks as basis for *Visualization(s) of Climate and Wildfire Projections* development.
- Iterate the tool through the project management approach and stakeholder engagement approach identified in Task 2.

- Build a novel *Visualization(s) of Climate and Wildfire Projections* utilizing Fifth California Climate Change Assessment data products stored in AWS S3 buckets through EPC-20-007.
- Showcase new *Visualization(s) of Climate and Wildfire Projections* on Cal-Adapt.
- Provide public access to *Visualization(s) of Climate and Wildfire Projections* through end of agreement, OR whenever all computational funds are expended, whichever occurs first.

Products:

- Visualization(s) of Climate and Wildfire Projections

Subtask 4.2: Visualizing Spatial and Temporal Distributions of Zero-Carbon Electricity Generation

The goal of this subtask is to portray projected changes in the temporal and spatial distributions of zero-carbon electricity generation resources investigated by Group 2.

The Recipient shall:

- Co-produce requirements and development plans for a *Zero-Carbon Resource Availability Visualization* with stakeholders and CAM (Subtask 2.1).
- Develop interactive visualizations that best meet the needs of energy sector users to portray projected changes in the temporal and spatial distribution of solar, wind, and hydroelectric resources as developed by the Group 2 recipient, considering:
    - A need to engage Group 2 team early:
        - Convey meta-data and format requirements needed for incorporation into data catalog.
        - Understanding of structure, resolution, and features of data.
    - Potential stakeholder needs for complex and non-complementary features:
        - point-based representations and spatial representations;
        - assets (i.e., transmission lines, generation assets);
        - regions where generation is not appropriate (i.e., protected, or inaccessible areas);
        - novel visualizations showing changes in temporal duration and structure of low-supply events;
        - novel visualization of co-occurring events that reduce supply; and
        - representation of spatial patterns of identified modes of climate variability critical to supply.
    - Perform testing to make sure functionality meets user needs.
    - Develop data visualizations or tool utilizing next-generation web API to optimize performance for querying multiple high temporal and spatial resolution GCM's over large spatial extents.
    - Iterate the tool through the project management approach and stakeholder engagement approach identified in Task 2.
- Build a novel *Zero-Carbon Resource Availability Visualization* utilizing Fifth California Climate Assessment data products stored in AWS S3 buckets through EPC-20-007.
- Showcase new *Zero-Carbon Resource Availability Visualization* on the Cal-Adapt web platform.
- Provide public access to *Zero-Carbon Resource Availability Visualization* through end of agreement, OR whenever all computational funds are expended, whichever occurs first.

Products:

- Zero-Carbon Resource Availability Visualization

Subtask 4.3: Planning and Communicating Changes in Visualizations and Tools

Not all functionality and data in the existing Cal-Adapt will be retained or remain relevant. The goal of this task is to identify and prioritize components and aspects that are to be maintained or developed.

The Recipient shall:

- Based on stakeholder input and close coordination with CAM, identify additional visualizations and tools in the existing Cal-Adapt that can be rebuilt or integrated into more generalized functionality in next-generation Cal-Adapt, along with a timeline for executing these rebuilds/integrations.
- Perform novel research into the next generation of tools and visualizations, including efforts to better characterize sources and modes of climate variability, and efforts to further support decision-making and investment under climate uncertainty.
- Develop a *Memorandum on Additional Visualizations, Tools, and Timeline* which will provide a clear scope and schedule to communicate what Cal-Adapt users should expect and will facilitate coordination with state agencies beyond the CEC.
- Prepare *CPR Report #1* and participate in a CPR meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- Memorandum on Additional Visualizations, Tools, and Timeline
- CPR Report #1

Subtask 4.4: Experimental and Innovative Computational and Tool Development for the Next Generation of Cal-Adapt

The goal of this task is to advance the scientific computing approaches utilized in Cal-Adapt, summarizing conclusions in a *Memorandum on Cal-Adapt Efficiency Studies*.

The Recipient shall:

- Perform novel research into the feasibility of:
    - Developing methods to reduce cloud data storage costs through cost-effective depreciation of uncommonly used files.
    - Utilizing cached datasets as a vehicle for pre-processing, and selectively storing some datasets in fast data storage bins.
    - Developing machine learning techniques to automate moving data into cold storage when it is not requested by Cal-Adapt users.
    - Utilizing prepackaged, vendor specific data pathways as a vehicle for passing data into visualization tools.
    - Utilizing prepackaged, vendor specific visualization programs in lieu of custom-built visualization tools.
- Summarize the above in a *Memorandum on Cal-Adapt Efficiency Studies*.

Products:

- Memorandum on Cal-Adapt Efficiency Studies

TASK 5: CAL-ADAPT AS A CLIMATE DATA SERVICE (OUTREACH & TRAINING)

The goal of this task is to develop energy sector capacity to make climate-informed decisions, in support of a transition to a zero-carbon electricity grid.

The Recipient shall:

- Perform Climate Data Service tasks such as**:**
  - Developing core educational materials to support visualizations developed in Task 4.
  - Develop user guidance to access tools developed in Task 3.
  - Meet with key stakeholders and help them to utilize project products.
- Transition from tool-based to need-based training:
  - Develop webinars or workshops which focus on decisions or problems facing the electricity sector, introducing the relevant climate science, statistical approaches and then showing how a tool/visualization can be used to address the issue – in contrast to the current approach of focusing events on new tools.
  - Leverage scientific expertise of EPC-20-007, EPC-18-026, and Group 1 & 2 of this GFO to provide added expertise and voices at training events.
  - Execute webinars or workshops in consultation with the CAM.
  - Collate engagement materials to support Technology Transfer to future recipients of EPIC funding via a *Training Materials Packet.*
- Perform outreach to engage new users through:
  - Participation in workshop and training events hosted by CEC EPIC grant numbers EPC-20-007, EPC-20-006, PIR-19-006, EPC-18-026, as well as Group 1 and Group 2 of this GFO (GFO-21-302).
  - Participate in CEC and OPR hosted events, including but not limited to:
    - CEC Staff Workshops; and
    - EPIC Symposium.
- Support a transition to a zero-carbon electricity grid through hands-on demonstration of project outcomes at a Statewide Workshop:
  - Attend and support execution of Statewide Workshop in support of Climate-Informed project partners.
- Pursue federal and other opportunities to expand training.

Products:

- Training Materials Packet

TASK 6: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by July 15th of each year. The Annual Survey includes but is not limited to the following information:
  - Technology commercialization progress
  - New media and publications
  - Company growth
  - Follow-on funding and awards received

- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund)and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:

- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund
- Documentation of Organization Profile on EnergizeInnovation.fund

TASK 7: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to ensure the scientific and techno-economic analysis and tools developed under this agreement are utilized in the energy policy, and/or planning decisions at the state and/or local levels, academic community and/or commercial sector.

The Recipient Shall:

- Develop and submit a *Knowledge Transfer Plan* that identifies the proposed activities the recipient will conduct to meet the goal of the task. The *Knowledge Transfer Plan* should include at a minimum:
  - Specific policy and planning efforts this project is expected to inform.
  - Specific stakeholder groups and energy policy and planning practitioners who will utilize the results of this project.
  - Proposed activities the recipient will conduct to ensure the tools and results from this project be utilized and adopted by the groups identified above.
- Present the Draft Knowledge Transfer Plan to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the Draft Knowledge Transfer Plan. This document will identify:
- TAC comments the recipient proposes to incorporate into the Final Knowledge Transfer Plan.
- TAC comments the recipient does not propose to incorporate, with an explanation why they should not be incorporated.
- Submit the Final Knowledge Transfer Plan to the CAM for approval.
- Implement the activities as described in the Final Knowledge Transfer Plan.
- Develop a *Technology Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.

- When directed by the CAM, develop presentation materials for a CEC-sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California CEC.
- 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.

Products:

- Knowledge Transfer Plan (draft and final)
- Summary of TAC Comments
- Technology Transfer Summary Report (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 22-0608-9b

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: EAGLE ROCK ANALYTICS

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

RESOLVED, that the CEC approves Agreement EPC-21-038 with Eagle Rock Analytics for a $750,000 grant to enhance the Cal-Adapt's web application to accommodate an increase in the volume of climate-related data produced through Electric Program Investment Charge initiatives, develop and execute new stakeholder-informed scientifically rigorous climate visualizations and tools. The effort will advance California's electricity sector's capacity to incorporate climate into investments, planning, and rulemaking, including supporting California's Fifth Climate Change Assessment; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC 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 CEC held on June 8, 2022.
AYE:
NAY:
ABSENT:
ABSTAIN:

_____
Liza Lopez
Secretariat