STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

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

A) New Agreement # EPC-19-056 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Jeffrey Sunquist	43	916-327-1623

C) Recipient's Legal Name	Federal ID Number
Energy and Environmental Economics, Inc.	94-3218646

D) Title of Project
Assessing Long-duration Energy Storage Deployment Scenarios to Meet California's Energy Goals

E) Term and Amount

Start Date	End Date	Amount
6/30/2020	3/31/2024	$ 1,500,000

F) Business Meeting Information

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

Proposed Business Meeting Date 6/25/2020 ☐ Consent ☒ Discussion

Business Meeting Presenter Jeffrey Sunquist Time Needed: 5 minutes

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

Agenda Item Subject and Description:

ENERGY AND ENVIRONMENTAL ECONOMICS, INC. Proposed resolution approving agreement EPC-19-056 with Energy and Environmental Economics, Inc. for a $1,500,000 grant to fund the analysis of different scenarios to help understand the role that long-duration energy storage (LODES) will play in the future of California's grid and adopting staff's determination that this action is exempt from CEQA. Additionally, the recipient will develop and provide a publicly available modeling toolkit to provide various regulators, policy-makers, and stakeholders with the ability to appropriately value the role of LODES. (EPIC funding) Contact: Jeffrey Sunquist (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:
      - ☒ Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section: This project involves only computer modeling and paper studies of energy storage scenarios. No physical construction will occur as part of this project. Therefore, it falls under the common sense exemption.

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**
UC San Diego	$ 99,000
Form Energy, Inc.	$ 250,812
	$
	$
	$
	$
	$
	$
	$
	$

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

Legal Company Name:

STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

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

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	18-19	301.001F	$1,500,000
			$
			$
			$
			$
			$

R&D Program Area: ESRO: ETSI TOTAL: $ 1,500,000

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: Amber Mahone

Address: 44 Montgomery St Ste 1500

City, State, Zip: San Francisco, CA 94104-4715

Phone: 415-391-5100

E-Mail: amber@ethree.com

2. Recipient's Project Manager

Name: Amber Mahone

Address: 44 Montgomery St Ste 1500

City, State, Zip: San Francisco, CA 94104-4715

Phone: 415-391-5100

E-Mail: amber@ethree.com

L) Selection Process Used

☒ Competitive Solicitation Solicitation #: GFO-19-308

☐ First Come First Served Solicitation Solicitation #:

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
Energy + Environmental Economics, Inc.

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2	X	Baseline Development
3		Characterize Energy Technology Alternatives
4	X	Scenario Development
5		Scenario Analysis
6		Public Workshops
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
LODES	Long-Duration Energy Storage
DER	Distributed Energy Resource
RA	Resource Adequacy
TAC	Technical Advisory Committee
UCSD	University of California, San Diego
WECC	Western Electricity Coordinating Council

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

A. Purpose of Agreement

The purpose of this Agreement is to develop a publicly-available modeling toolkit that regulators, policy-makers, and other stakeholders can use to appropriately value the role of Long-Duration Energy Storage (LODES) and develop a clear understanding of the role that LODES will play in the future of California's grid by analyzing different energy storage scenarios in a deeply decarbonized economy.

[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.

B. Problem/ Solution Statement

Problem

California has established aggressive goals for greenhouse gas (GHG) reductions, both in the electric sector and economywide. In 2018, Governor Brown extended those goals by signing SB 100, which requires all retail electricity to be supplied by zero-carbon resources by 2045, and an executive order calling for the state to achieve carbon neutrality by 2045 (EO B-55-18). Previous studies have indicated that GHG reductions of 90% or more in the electricity sector are achievable, at what is likely a reasonable cost, using today's technologies. This includes a mix of solar PV, wind resources from in-state and out-of-state as well as offshore, and existing energy storage technologies such as lithium-ion batteries and pumped hydro or compressed air.

However, previous resource adequacy studies for California still include 17 to 35 GW of natural gas generation capacity, and 6 to 10 million metric tons of greenhouse gas emissions from the electricity sector in 2050. In these scenarios, gas generation capacity is used to maintain reliable electricity service during extended periods of low wind and solar production, especially when these low-renewable production periods coincide with high electric demand. Eliminating these firm capacity resources, and the last few million tons of GHG emissions, is extremely costly with today's technologies and likely requires new technology, such as LODES, to be cost-effective for California's ratepayers.

Solution

The Recipient will characterize LODES technologies by duration, cost, size limitation, operating restrictions and more to provide a fair comparison of the storage options. The Recipient will further design electricity system modeling tools that can quantify the value of these LODES resource options, their operations and balancing provided on the bulk grid. This will help appropriately represent the value of LODES to the bulk grid. The Recipient will use these tools to develop scenarios representing future energy resource mixes and levels of electrification in a deeply decarbonized economy. This will enable a fair comparison of the value that LODES technologies bring to a system portfolio, and how much of it, compared with other clean energy resource options. This will help state agencies develop plans for implementation of LODES.

C. Goals and Objectives of the Agreement

Agreement Goals

The goal of this Agreement is to

- Evaluate different scenarios for the deployment of LODES to meet California's mandates to decarbonize the electricity sector by 2045
- Develop an evaluation framework and toolkit that appropriately values LODES technologies as potential resources in California's future grid, which will include information on:
    - Ability of LODES to provide different grid balancing and reliability services
    - Optimal durations for LODES to support various applications in the State
    - Locations for LODES in supporting various applications in the State
    - Reasonable cost-effectiveness targets for LODES to be competitive in various applications in the State

- Updated, publicly-available datasets to support analysis of LODES and California's future grid

Ratepayer Benefits:[2]

This Agreement will provide California IOU ratepayers with the following benefits:

- **Generate economic benefits.** Recipient will publish results of this analysis to recommend the most cost-effective utility grid infrastructure changes and options for LODES that will reach the State policy goals in 2030 and 2045. Additionally, Recipient will publish the resulting tools as an open-source modeling framework and dataset, providing California stakeholders with new tools to support planning and deployment of LODES and other investigated technologies to achieve a cost-effective and reliable zero-carbon grid. Effective electricity resource planning will lower total electricity procurement costs, which will in turn lead to lower electricity rates for customers.
- **Promote greater reliability.** Recipient will develop an electricity resource planning toolkit that can adequately assess and evaluate electric reliability on a zero-carbon grid—taking into account variable and uncertain renewable electricity generation and electric loads—to quantifiably ensure that California's grid can maintain or exceed current levels of reliability.
- **Increase resiliency.** Recipient will create scenarios that can evaluate the different roles LODES can play for the California grid of 2045. The scenario results will point the way towards a more resilient grid that is safer from experiencing outages and can respond more effectively to future contingencies.
- **Reduce greenhouse gas (GHG) emissions and enable climate adaptation.** The scenarios evaluated in this research will illustrate ways to replace California's existing fossil fuel generating systems with a combination of renewables and energy storage, to lower the GHG emissions of the grid and support the carbon free goal of SB100.

Technological Advancement and Breakthroughs:[3]

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory climate goals by providing the State and stakeholders with a new analytical toolkit that addresses key data & analytical shortcomings of existing capacity expansion models. This new modeling toolkit will enable users—including policy-makers and other key stakeholders—to develop scenarios for a zero-carbon grid that is reliable, resilient, and aligned with California's economy-wide decarbonization goals. This advancement will be achieved by implementing new optimization and model reduction techniques to represent

[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 and energy goals.

operational periods greater than one day (e.g., one week or seasonal operations) and stochastic modeling of low-probability events that drive reliable system planning and portfolio design. Additionally, the assessment of future energy storage and energy generation technology alternatives could accelerate the development and adoption of LODES technologies that help the State achieve its climate goals.

Agreement Objectives

The objective of this project is to develop a clear understanding of the role that LODES can and should play in achieving California's energy and climate goals. This objective can be summarized in three parts:

- Evaluate the tradeoffs between energy storage duration, performance and cost, against a range of resource supply options and electric load conditions.
- Develop an updated, publicly available dataset to characterize potential futures for California's grid in the context of deep decarbonization, including characterization of new energy storage and energy generation technologies.
- Develop an open-source modeling toolkit that extends California's capabilities to plan for a deeply decarbonized electric sector, incorporating LODES and new energy generation technologies into the resource mix.

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).** 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, including the Final Report Outline and Final Report

- 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 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.

EXHIBIT A
Scope of Work
Energy + Environmental Economics, Inc.

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.

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

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 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 the 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. *(See Task 1.1 for requirements for draft and final products.)*

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

CAM Product:
- Style Manual
- Comments on Draft Final Report Outline
- Acceptance of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:
- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
  - Ensure that the report includes the following items, in the following order:
    - Cover page (**required**)
    - Credits page on the reverse side of cover with legal disclaimer (**required**)
    - Acknowledgements page (optional)
    - Preface (**required**)
    - Abstract, keywords, and citation page (**required**)

        - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
        - Executive summary (**required**)
        - Body of the report (**required**)
        - References (if applicable)
        - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
        - Bibliography (if applicable)
        - Appendices (if applicable) (Create a separate volume if very large.)
        - Attachments (if applicable)
    - Ensure that the document is written in the third person.
    - Ensure that the Executive Summary is understandable to the lay public.
        - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
        - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
        - If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
    - Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
    - Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
    - Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:
- Final Report (draft and final)
- Written Responses to Comments on the Draft 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 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.
    - 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 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)*

EXHIBIT A
Scope of Work
Energy + Environmental Economics, Inc.

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. The list shall include the expertise of each proposed TAC member and the value to the project.
- 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.

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
Energy + Environmental Economics, Inc.

IV. TECHNICAL TASKS

TASK 2: BASELINE DEVELOPMENT

The goal of this task is to develop baseline inputs and assumptions to characterize California's future grid.

The Recipient shall:

- Compile existing publicly available datasets for California.
- Develop baseline of current grid conditions based on publicly available information. This will include, but is not limited to,
    - Existing & planned resource portfolios;
    - Resource potentials & cost projections;
    - Fuel price forecasts;
    - Distributed energy resources (DERs) (including demand response, energy efficiency and microgrids);
    - Hourly load profiles & forecasts (including for building and vehicle electrification); and
    - Transmission and distribution reliability & resiliency upgrade costs.
    - Annual grid emissions & curtailment
- Describe model limitations of existing suite of modeling tools.
- Summarize the inputs and assumptions of the baseline grid conditions in the *California Baseline Inputs & Assumptions Presentation.*
- Prepare a *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- California Baseline Inputs & Assumptions Presentation
- CPR Report #1

TASK 3: CHARACTERIZE ENERGY TECHNOLOGY ALTERNATIVES

Subtask 3.1 LODES Technology Alternatives Review

The goal of this task is for UCSD-CER to characterize the costs, potentials, and operating characteristics of future LODES technology alternatives.

The Recipient shall:

- Characterize LODES technology alternatives, which could include, but are not limited to,
    - Hydrogen electrolysis and storage;
    - Electrochemical LODES;
    - Compressed-air energy storage; and
    - Thermal energy storage technologies.
- Summarize the findings on various LODES technologies in the *LODES Technology Review Presentation;* this will include the following information on identified LODES technologies:
    - Stage of development
    - Cost estimates and projected learning curves (if applicable) for potential LODES technologies

- Technology efficiency and energy requirements (if applicable)
- Size limitations (if applicable)
- Locational constraints (if applicable)
- Other key technological characteristics

Products:

- LODES Technology Review Presentation

Subtask 3.2 LODES Technology Modeling Assumptions

The goal of this task is to convert the data gathered on LODES technology alternatives into modeling assumptions suitable for use in capacity expansion models.

The Recipient shall:

- Create modeling inputs for each LODES technology, which could include, but is not limited to:
  - Storage duration (ranging from four or less hours to 100+ hours),
  - Capacity and energy cost,
  - Roundtrip efficiency,
  - Parasitic losses,
  - Storage performance degradation,
  - Resource potentials.
- Document modeling inputs in the *LODES Modeling Characteristics Presentation*.

Products:

- LODES Modeling Characteristics Presentation

Subtask 3.3 Energy Generation Technology Alternatives

The goal of this task is to characterize future energy generation technologies that are not currently in widespread use in California's grid today.

The Recipient shall:

- Characterize a range of new energy generation technologies, in addition to currently available technologies assumed in the baseline developed in Task 2. This could include, but is not limited to resources listed in the following table:

Generation or resource flexibility	Options and Notes
Solar	Distributed and central scale PV, single axis, dual axis, solar thermal
Wind	On-shore, offshore, distributed
Geothermal	conventional and advanced (e.g. horizontal fracking)
Hydroelectric	Uprates, decommissioning, and new small hydro
Gas turbines	With and without carbon capture and sequestration (CCS), Combined cycle, combustion turbine, reciprocating engines, Allam cycle, existing, retirements & potential for retrofits to combust hydrogen
Diesel generation	Distributed diesel generation, potentially running on biodiesel as a back-up generation resources during reliability events
Fuel cells	Distributed, potentially as back-up generation during reliability events, fueled by methane or hydrogen
Nuclear	Retirements, out-of-state new technologies, small modular, molten salt reactor
Flexible loads and demand response	Flexible charging of electric vehicles, flexible use of electric end uses such as electric storage hot water heaters, pre-heating and pre-cooling of buildings using electric HVAC, and other demand response
Imports and exports from California	Assuming different futures around new transmission development and regional coordination across the WECC

- Characterize additional technologies that can reduce total emissions from energy generation, such as direct air capture
- Document technology assumption as the *California Future Energy Generation Technologies Presentation.*

Products:
- California Future Energy Generation Technologies Presentation

TASK 4: SCENARIO DEVELOPMENT
The goal of this task is to develop potential scenarios that span the range of future grid conditions, LODES, and energy generation technology alternatives characterized in previous tasks.

The Recipient shall:
- Develop updated GHG mitigation scenarios using E3's PATHWAYS tool as needed, such as to reflect economywide carbon neutrality by 2045.
- Develop a range of three scenarios that captures a range of grid conditions and technologies described above that will align with the deep decarbonization pathways described in CEC-500-2018-002 Staff Report. These could include, but are not limited to, combinations listed in the following table:

Electricity demand	Load flexibility	Generation Resources	Electricity resiliency approaches
High	High	Renewables only	Focus on grid hardening (e.g. transmission under-grounding)
Moderate	Moderate	Renewables including RNG	Less grid hardening combined with wide-spread deployment of renewable microgrids
Low	Low	Renewables, RNG and new zero-carbon baseload generation	Less grid hardening combined with wide-spread deployment of hydrogen/RNG-fueled microgrids

- Document assumptions in the *California Scenario Assumptions Presentation.*
- Prepare a *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings)
- Participate in a CPR meeting.

Products:
- California Scenario Assumptions Presentation
- CPR Report #2

TASK 5: SCENARIO ANALYSIS

Subtask 5.1 Preliminary Analysis
The goal of this task is to perform preliminary analyses over the course of the first 6 months of the project to assess the value of LODES under various system scenarios as selected by the CEC and TAC.

The Recipient shall:
- Develop least-cost resource portfolios that select the optimal size and duration of different LODES technology alternatives based on projected costs under various system scenarios using Recipients' existing suite of tools (RESOLVE, RECAP, and FormWare). This analysis will be informed by services that include, but are not limited to,
    - Energy arbitrage;
    - Operating reserve (e.g., inertia, fast frequency response, regulating, load-following, spin, and non-spin);
    - Renewable Portfolio Standard;
    - Grid greenhouse gas emissions;
    - System Resource Adequacy;
    - Local Resource Adequacy;
    - Transmission capacity;
    - Distribution capacity; and
    - Distribution & customer resiliency.
- Compare scenarios in the preliminary analysis to the baseline based on the following criteria, with additional input from the CAM and TAC:
    - Economywide decarbonization pathway and linkage to electric sector
    - Available resource potential and projected resource costs
    - Total Resource Cost

  - Societal Cost Test
  - GHG emissions
- Perform in/out cases for different LODES technology alternatives to assess changes in California's resource portfolio build and operational decisions, which will inform the price point needed to make each of these technologies viable based on available value streams.
- Identify value streams or modeling limitations that require additional development and refinement in the final scenario analysis to appropriately capture the value of LODES in each scenario.
- Summarize the modeling methodology and challenges, scenario results and comparison with the baseline, and the identified value of LODES technology alternatives under different conditions in the *Preliminary LODES Analysis Report.*

Products:
- Preliminary LODES Analysis Report

Subtask 5.2 UCSD Zero-Carbon Microgrid Case Study
The goal of this task is to use the University of California, San Diego (UCSD) campus microgrid—a 30 MW system—as a case study for the viability of various LODES alternatives to achieving a zero-carbon microgrid.

The Recipient shall:
- Perform a preliminary analysis on the optimal size and duration of different LODES technology alternatives to meet campus microgrid operations.
- Summarize findings from the UCSD LODES campus microgrid analysis in the *Preliminary UCSD Zero-Carbon Microgrid Analysis Report;* this will include and is not limited to*:*
  - A description of UCSD's campus microgrid operations
  - A summary of the analysis methodology
  - An evaluation of optimal LODES technology options to meet their microgrid operations

Products:
- Preliminary UCSD Zero-Carbon Microgrid Analysis Report

Subtask 5.3 New Modeling Toolkit Development & Delivery
The goal of this subtask is to inform development of a New Modeling Toolkit of planning models that addresses the shortcomings of existing tools to appropriately value the role of LODES and future energy generation technologies in California's future grid.

The Recipient shall:
- Review the literature on existing modeling tools and the findings from the preliminary analysis (which utilized existing modeling tools) to inform development of *New Modeling Toolkit.*
- Develop a public dataset of weather and hourly load and renewable resource production profiles using historical and/or simulated data that captures a wider range of weather conditions
- Investigate and implement new time domain reduction techniques (superseding the day sampling algorithm currently used in E3's RESOLVE model) that will efficiently capture the value of LODES over multi-day and/or seasonal operations.

- Develop a new, flexible data structure that allows users to efficiently tradeoff between model speed (for faster analysis of multiple model cases), temporal resolution (for finer operational detail in specific model cases), and spatial extent (for finer locational granularity such as at the level of a Local Capacity Requirement area) using the same underlying dataset.
- Incorporate the multidimensional system RA interaction between LODES, other storage technologies, variable energy resources (e.g., wind and solar), and other energy-limited resources.
- Incorporate robust & stochastic optimization techniques to capture low-likelihood events and inform "least-regrets" decision-making for long-term capacity expansion planning.
- Refine methods for correlating load modifiers (such as heating loads) to underlying weather conditions to better capture the impact of new, potentially weather-driven loads on the resource needs.
- Utilize state-of-the-art methods to release the New Modeling Toolkit and associated data as an open-source set of tools for stakeholders and users.
- Prepare documentation *New Modeling Toolkit Documentation & User Guide* that describes how New Modeling Toolkit captures value of LODES for both system- and local-level planning questions stakeholders on how to use the tool.

Products:
- New Modeling Toolkit (draft and final)
- New Modeling Toolkit Documentation & User Guide (draft and final)

Subtask 5.4 Final Scenario Analysis
The goal of this subtask is to perform a detailed analysis of the final scenario selected by the CAM using the New Modeling Toolkit.

The Recipient shall:
- Conduct a detailed analysis of the role of LODES in the final scenario (or scenarios)—such as on system reliability and resiliency—using the New Modeling Toolkit, based on direction from the CAM and TAC.
- Use the same metrics, and any others identified by CAM and TAC, as used in Task 5.1 to compare least-cost portfolios of resources with LODES and the value of LODES technologies relative to the baseline.
- Use sensitivity analysis to characterize the significance of different factors to affect the state goals and value of LODES*.*
- Characterize potential policies or utility rate structures that pay for the grid support services provided by LODES, such as for microgrid service.
- Document final analysis results in a *Final LODES Analysis Report.*

Products:
- Final LODES Analysis Report

TASK 6: PUBLIC WORKSHOPS

Subtask 6.1 Introductory Public Workshops

The goal of this task is to mark the start of Phase I of this project by planning public workshops throughout the duration of the project to solicit stakeholder feedback.

The Recipient shall:

- Plan two public workshops with the CEC. One workshop will be in Northern and one will be in Southern California, to introduce the project and gather information from stakeholders to inform subsequent analysis.
- Prepare a *LODES Analysis Introductory Workshop Agenda* including the location, organizers, presenters, and surveys before these workshops.
- Provide stakeholders with an overview of the project in the form of the *LODES Analysis Introductory Workshop Presentation*; this will include and is not limited to:
    - An overview of the analysis tools and methodology used to evaluate LODES
    - Initial results and metrics that highlight the value and role of LODES in meeting California's energy and capacity needs while meeting the State's climate targets.
- Prepare a *LODES Analysis Introductory Workshop Summary,* which will summarize input collected from public from the workshop.

Products:

- LODES Analysis Introductory Workshop Agenda
- LODES Analysis Introductory Workshop Presentation
- LODES Analysis Introductory Workshop Summary

Subtask 6.2 Data & Scenario Selection Public Workshop

The goal of this task is to present inputs & assumptions to the CEC and TAC to inform scenario development that span the range of future grid conditions, LODES, and energy generation technology alternatives.

The Recipient shall:

- Plan a public workshop with the CEC including the location, organizers, and presenters.
- Prepare a *Data & Scenario Selection Workshop Agenda* before this workshop.
- Present the inputs, range of scenarios, and modeling approach to the CEC and TAC at the public workshop in the form of the *Data and Scenario Selection Workshop Presentation*.
- Solicit feedback from the CEC and TAC on modifications to the scenarios and modeling approaches.
- Prepare a *Data & Scenario Selection Workshop Summary,* which will summarize input collected from public from the workshop.
-

Products:

- Data & Scenario Selection Workshop Agenda
- Data & Scenario Selection Workshop Presentation
- Data & Scenario Selection Workshop Summary

Subtask 6.3 Final Scenario Selection Public Workshop

The goal of this task is to mark the start of Phase II of the project by presenting the findings the preliminary analysis of three scenarios for the CEC and TAC to provide input on direction for the final detailed analysis of a scenario.

The Recipient shall:

- Plan a public workshop with the CEC.
- Prepare a *Final Scenario Selection Workshop Agenda* including the location, organizers, presenters, and surveys before these workshops.
- Present the findings from the above preliminary analysis in the public workshop and document findings presented in the workshop in the *Preliminary LODES Analysis Presentation.*
- Present findings on zero-carbon microgrid operations in the *Preliminary UCSD Zero-Carbon Microgrid Analysis Presentation.*
- Discuss with the CEC and TAC to determine the final scenario to pursue for final, detailed analysis over the course of the following two years.
- Prepare a *Final Scenario Selection Workshop Summary*, which will summarize input collected from public from the workshop.

Products:

- Final Scenario Selection Workshop Agenda
- Preliminary LODES Analysis Workshop Presentation
- Preliminary UCSD Zero-Carbon Microgrid Analysis Presentation
- Final Scenario Selection Workshop Summary

Subtask 6.4 Final Public Workshop

The goal of this subtask is to present the final New Modeling Toolkit and results of the final scenario analysis to the CEC and TAC.

The Recipient shall:

- Discuss the delivered New Modeling Toolkit to CEC and TAC.
- Plan a public workshop with the CEC.
- Prepare a *Final Public Workshop Agenda* including the location, organizers, presenters, and surveys before these workshops.
- Plan a final public workshop with the CEC including the location, organizers, and presenters.
- Present the findings of the final analysis in the form of a *Final LODES Scenario Analysis Presentation* at the final public workshop; this will include but is not limited to:
    - Description of the final scenario(s) selected by the CAM
    - Results of the final scenario(s) and their least cost-portfolios
    - Description of the role and value of LODES in the scenario least-cost portfolios and their sensitivities
    - Expected value of various grid services, such as energy, capacity, and ancillary services, as well as others identified in coordination with the CAM that can be served by LODES
    - Evaluation of policies and utility rate structures that could support the deployment and grid-use of LODES
- Prepare a *Final Public Workshop Summary*, which will summarize input collected from public from the workshop.

Products:

- Final Public Workshop Agenda
- Final LODES Scenario Analysis Presentation
- Final Public Workshop Summary

TASK 7: 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:

    - For Product Development Projects and Project Demonstrations:
        - Published documents, including date, title, and periodical name.
        - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
        - Greenhouse gas and criteria emissions reductions.
        - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
        - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
        - A discussion of project product downloads from websites, and publications in technical journals.
        - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
        - Additional Information for Product Development Projects:
            - Outcome of product development efforts, such copyrights and license agreements.
            - Units sold or projected to be sold in California and outside of California.
            - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
            - Investment dollars/follow-on private funding as a result of Energy Commission funding.
            - Patent numbers and applications, along with dates and brief descriptions.
        - Additional Information for Product Demonstrations:
            - Outcome of demonstrations and status of technology.
            - Number of similar installations.
            - Jobs created/retained as a result of the Agreement.

- For Information/Tools and Other Research Studies:
  - Outcome of project.
  - Published documents, including date, title, and periodical name.
  - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
  - The number of website downloads.
  - An estimate of how the project information has affected energy use and cost, or 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 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The 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(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

RESOLUTION NO: 20-0708-8a

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: ENERGY AND ENVIRONMENTAL ECONOMICS, INC.

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-19-056 with Energy and Environmental Economics, Inc. for a $1,500,000 grant to fund the analysis of different scenarios to help understand the role that long-duration energy storage (LODES) will play in the future of California's grid. Additionally, the recipient will develop and provide a publicly available modeling toolkit to provide various regulators, policy-makers, and stakeholders with the ability to appropriately value the role of LODES; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her 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 July 8, 2020.

AYE:
NAY:
ABSENT:
ABSTAIN:

Cody Goldthrite
Secretariat