



GRANT REQUEST FORM (GRF)

A) New Agreement # EPC-19-038 (to be completed by CGL office)

B) Division	Agreement Manager:	MS-	Phone
ERDD	Elise Ersoy		916-327-1367

C) Recipient's Legal Name	Federal ID Number
Smartville, Inc.	84-2188846

D) Title of Project
Low-Cost and Easy-to-Integrate Second-Life Battery HUB

E) Term and Amount

Start Date	End Date	Amount
6/30/2020	3/31/2024	\$ 2,035,787

F) Business Meeting Information

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

Proposed Business Meeting Date 6/10/2020 Consent Discussion

Business Meeting Presenter Tanner Kural Time Needed: 5 minutes

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

Agenda Item Subject and Description:

SMARTVILLE, INC. Proposed resolution approving agreement EPC-19-038 with Smartville, Inc. for a \$2,035,787 grant to characterize the degradation of repurposed electric vehicle battery modules and validate the ability of these resources to provide building resiliency and load shifting services and adopting staff's determination that this action is exempt from CEQA. The goal is to allow multiple second-life battery form factors and module types, from multiple original equipment manufacturers, to be integrated and actively exchanged within a single system architecture. Contact: Tanner Kural.

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: 15304

Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section:

Class 4 projects consist of minor public or private alterations in the condition of land which do not involve the removal of healthy, mature, scenic trees. Based on the above project description, the proposed project is exempt under 14 CCR section 15304 Minor Alterations to Land. The proposed



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project consists of minor temporary use of land having no permanent effects on the environment and minor trenching where the surface would be restored. In addition, none of the exceptions to the exemptions apply.

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; University of California San Diego	\$ 362,637
TBD - Consultant/Contractor	\$ 56,000
TBD - Consultant/Contractor	\$ 50,000
Electric Power Research Institute, Inc.	\$ 99,000
TBD - Electrical Engineer and Construction	\$ 409,400
	\$

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

Legal Company Name:
ARPA-E

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	18-19	301.001F	\$2,035,787
			\$
			\$

R&D Program Area: EGRO: Renewables

TOTAL: \$ 2,035,787

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:



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K) Recipient's Contact Information

1. Recipient's Administrator/Officer

Name: William Torre
Address: 10915 Technology PI Ste
200

City, State, Zip: San Diego, CA
92127-1811

Phone: 858-692-2592
E-Mail: bill@smartville.io

2. Recipient's Project Manager

Name: Michael Ferry
Address: 10915 Technology PI Ste
200

City, State, Zip: San Diego, CA
92127-1811

Phone: 510-305-2944
E-Mail: mferry@smartville.io

L) Selection Process Used

- Competitive Solicitation Solicitation #: GFO-19-310
- First Come First Served Solicitation Solicitation #:

M) The following items should be attached to this GRF

- | | | |
|---|-------------------------------------|----------|
| 1. Exhibit A, Scope of Work | <input checked="" type="checkbox"/> | Attached |
| 2. Exhibit B, Budget Detail | <input checked="" type="checkbox"/> | Attached |
| 3. CEC 105, Questionnaire for Identifying Conflicts | <input checked="" type="checkbox"/> | Attached |
| 4. Recipient Resolution | <input checked="" type="checkbox"/> | N/A |
| 5. CEQA Documentation | <input checked="" type="checkbox"/> | N/A |
| | <input type="checkbox"/> | Attached |
| | <input type="checkbox"/> | Attached |

Agreement Manager

Date

Office Manager

Date

Deputy Director

Date

EXHIBIT A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Heterogenous Unifying Battery Energy Storage System Use Case Analysis and Design
3		Second-Life Battery Laboratory Testing
4		Design and Develop Heterogenous Unifying Battery Energy Storage System
5		Heterogenous Unifying Battery Energy Storage System Construction, Installation and Site Commissioning
6	X	Heterogenous Unifying Battery Energy Storage System Demonstration
7	X	Testing and Demonstration Result Analysis
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities
10		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
BMS	Battery Management System
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CPUC	California Public Utilities Commission
EMS	Energy Management System
ESS	Energy Storage System
EV	Electric Vehicle
HUB	Heterogenous Unifying Battery
PV	Photovoltaic
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this solicitation is to fund an applied research and development project that will develop a validated and replicable approach to repurposing retired electric vehicle (EV) batteries for stationary energy storage applications (second-life EV battery).

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.

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B. Problem/ Solution Statement

Problem

As California approaches its goal of five million zero-emission vehicles on the road by 2030 (Brown, Executive Order B-48-18), there is an increasing need to find alternative applications for the vehicle batteries after they have reached the end-of-life in the vehicle application. However, the cost-effectiveness of reusing second-life EV batteries is hindered by lengthy and costly processes of logistics and repurposing, compromised system performance, and long-term safety and reliability concerns.

Solution

The Recipient, in collaboration with Subcontractors, will lead system development for deployment and demonstration of a low-cost, easy-to-integrate second-life heterogeneous unifying battery (HUB) energy storage system (ESS). The HUB ESS will be deployed at a commercial facility with critical backup power needs and existing onsite solar photovoltaic (PV). The HUB ESS will demonstrate demand charge reduction, solar energy shifting, and critical load support up to and beyond 24 hours. A minimum of a one-year demonstration will be conducted to validate overall system capacity loss of less than three percent, by customizing cell operation boundaries and performing life balancing. The project will also demonstrate efficient and accurate state of battery health estimation in order to develop a work plan for UL1974 and UL1973 certifications. Finally, post-testing analyses with the Subcontractor will develop a pathway to achieve a cost target of \$150/kWh system cost and \$40/kWh year annualized cost.

The Recipient's HUB ESS will combine a modular plug-and-play power converter matrix design with a unique distributed battery estimation and a life balancing energy management system (EMS) to achieve superior performance in extending battery cycle life, improving safety and reliability, and maximizing benefits to behind-the-meter customers. As California continues to pioneer in renewable energy and electrifying transportation, The Recipient's HUB ESS will help overcome barriers to achieving the State's statutory energy goals.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of developing the ESS HUB solution Agreement are to:

- Goal 1: Characterize a second-life EV battery's degradation rate over time through bench-scale cycling tests accelerated over an equivalent of six years or more;
- Goal 2: Validate the ability of a second-life EV battery, when paired with a solar PV system, to provide building resiliency and load shifting services for a small/medium-sized commercial building;
- Goal 3: Develop and demonstrate technology improvements and operational strategies that minimize degradation and maximize the useful life of the second-life EV battery;
- Goal 4: Compare the cost and performance data of the second-life EV battery to that of an equivalent new off-the-shelf stationary battery; and
- Goal 5: Accelerate widespread customer adoption of distributed energy resources.

Agreement Objectives

To achieve these goals, the Project Team has identified measurable objectives:

- Objective 1: Perform laboratory testing to create a battery post-EV degradation model in for California market-based stationary energy storage applications, and control for variables such as cycling rate and temperature.

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- Objective 2: Conduct real-world behind the meter demonstration coupling with solar power and business energy demand, to understand ESS benefits to the end customer.
- Objective 3: Provide reliable performance for 20 years with easy battery swapping.
- Objective 4: Achieve low-cost \$40/kWh-year, <3 percent/year average cell degradation.
- Objective 5: Develop a novel second-life battery integration HUB topology, with distributed converter matrix and modular battery management system (BMS), and demonstrate its cost and performance advantages.
- Objective 6: Conduct data analysis to assess greater reliability, lower costs, and increased solar penetration for investor owned utility ratepayers.
- Objective 7: Conduct techno-economic analysis in order to make strategic investment in performance improvement.

Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of

- Lower costs: Extending EV battery life will reduce the lifecycle cost of EV ownership.
- Greater reliability: Second-life EV batteries provide reserve energy capacity to maintain a utility's power reliability at lower cost by displacing more expensive and less efficient assets like old combined-cycle gas turbines.
- Economic development: The usage of second-life EV batteries will create jobs in battery refurbishing business.
- Environmental benefits: Recycling battery packs can be processed to extract valuable rare-earth materials.
- Public health: Hospitals and other health facilities can take advantage of power-arbitrage opportunities by storing renewable power for use during periods of scarcity, thus reducing the cost of operation.
- Consumer appeal: Current cost differential between investing in new storage system is between 30 to 70 percent higher than repurposed second-life EV batteries. If cost differential is high, investing in second-life batteries will be appealing to customers.
- Energy security: Second-life EV battery storage systems provide greater grid flexibility and firming to the grid, providing energy security. The facility and its operations will greatly benefit from a dedicated ESS supporting the critical load of environmental controls as well as from daily demand charge reduction and energy shifting. This use case closely fits the operation of many small businesses and buildings, such as restaurants, commercial refrigeration, and grocery stores. This demonstration will pave the path to 100 percent zero-carbon energy by 2045 (SB 100) and reducing GHG emissions (SB 32, SB 350).

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 energy goals by the following actions:

Superior long-term performance and reliability: Using a modularized power converter matrix and EMS, the proposed solution enables (1) customized battery operation boundaries (independent call group amperage control) to improve overall system performance, and (2) optimized

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.

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degradation control that unifies battery health over long-term usage. This solution addresses single module failures via asynchronous battery module swapping, which reduces system maintenance costs and leads to improved long-term performance and reliability. As a result, the HUB ESS can be deployed at locations and services in place of systems relying on new battery and storage resources, helping both the California Public Utilities Commission to achieve its procurement goals (AB 2514) and commercial/industrial sectors to realize the benefit of behind-the-meter energy storage (AB 2868, SB X1-2).

Low-cost integration topology: The Recipient's approach will eliminate high labor costs associated with second-life battery screening, testing, and binning by utilizing independent power control and model-based estimation to automatically learn battery health information. This will drastically reduce battery shelving and storage time to minimize calendar aging losses, while the module hot-swapping capability will maximize service revenue by minimizing system down time. The solution will achieve 30–50 percent cost reduction compared to new ESS alternatives. In this project, battery packs from at least two EV models will be utilized.

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:

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○ **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 or another format approved by the CAM.

○ **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#, Python, and/or Matlab Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other Energy Commission staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting.

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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:

- 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

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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.

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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

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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.

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- 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 receiving the CAM's comments, 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

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(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.

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Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
 - Technical area expertise;
 - Knowledge of market applications; or
 - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

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

- Researchers knowledgeable about the project subject matter;

EXHIBIT A

Scope of Work

- 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.

EXHIBIT A

Scope of Work

- 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.

Products:

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

IV. TECHNICAL TASKS

TASK 2: HETEROGENOUS UNIFYING BATTERY ENERGY STORAGE SYSTEM USE CASE ANALYSIS AND DESIGN

The goals of this task are to: (1) Conduct and analyze HUB ESS use case; and (2) Perform design and optimization of battery power and energy size.

The Recipient shall:

- Analyze the past two years' meter data of the critical load from the site host.
- Analyze solar production data from the site host.
- Perform design and optimization on battery power and energy size, considering feasibility of space occupation, power access, and code compliance. From use case simulation, battery size and operation strategy will be finalized.
- Simulate five different single use applications: demand charge management, real-time solar arbitrage, day ahead planned solar arbitrage, front of the meter time shifting, frequency regulation, and two cases value-stacked use cases.
- Determine duty cycle for representative use cased for laboratory testing.
- Produce a *Report on Site Planning and Operational Strategy* that will include: summary of HUB ESS use case analyses; site installation plan; and plan for design and optimization of battery power and energy size.
- Prepare *Simulation Result Document* that includes technical and single use application results of the simulation.

Products:

- Report on Site Planning and Operational Strategy
- Simulation Result Document

TASK 3: SECOND-LIFE BATTERY LABORATORY TESTING

The goals of this task are to: (1) Perform duty cycle test; (2) Perform date characterization and model identification; and (3) Extract battery aging models.

EXHIBIT A

Scope of Work

The Recipient shall:

- Review and study market-oriented solar arbitrage and demand charge reduction applications based on California utility pricing developed in Task 2.
- Utilize an existing model which includes degradation pattern for battery capacity and internal resistance to perform data characterization and model identification.
- Prepare *Report on Second-Life Battery Laboratory Testing* that will include a summary of the research question, methodology used, and findings as they relate to: duty cycle testing, data characterization, model identification, and battery aging models. Prepare *Battery Aging Model* (using Python and/or Matlab) that is capable of characterizing a second-life battery state of health and projected performance in an ESS application.

Products:

- Report on Second-Life Battery Laboratory Testing
- Battery Aging Model

TASK 4: DESIGN AND DEVELOP HETEROGENOUS UNIFYING BATTERY ENERGY STORAGE SYSTEM

The goals of this task are to: (1) Design and development four sub-components (Skid, EMS software, power converter integration, and battery adapter fabrication); and (2) Test and validate subcomponent design and provide a complete design document and development plan.

The Recipient shall:

- Perform electrical and civil engineering of a 20ft ESS skid.
- Control system engineering with industrial linux-based system and cloud platform.
- Control algorithm develop for a modular EMS.
- Integrate distributed power converter and BMS production.
- Fabricate battery adapter for at least two types of EV battery modules.
- Produce *Design Documents of System Subcomponents* to document the design of skid, EMS software, power converter integration, and battery adapter fabrication.
- Produce *Complete Design Document and Source Code for Modular EMS* that documents the entire system design and code that runs the modular EMS.

Products:

- Design Documents of System Subcomponents
- Complete Design Document and Source Code for Modular EMS

TASK 5: HETEROGENOUS UNIFYING BATTERY ENERGY STORAGE SYSTEM CONSTRUCTION, INSTALLATION AND SITE COMMISSIONING

The goals of this task are to: (1) Develop a HUB ESS construction plan; and (2) Install the system and perform site commissioning.

The Recipient shall:

- Coordinate off-site build, on-site preparation, permitting, on-site installation, and energization.
- *Prepare a HUB ESS Testing and Production Plan* that documents the testing metrics, timeline, and production plan of the field demonstration HUB ESS.
- Perform preliminary testing of on/off operation, nominal operation, emergency/safety responses, and automated operation of HUB ESS.

EXHIBIT A

Scope of Work

- Prepare a *HUB ESS Installation and Commissioning Report* that summarizes the preliminary testing results.

Products:

- HUB ESS Testing and Production Plan
- HUB ESS Installation and Commissioning Report

TASK 6: HETEROGENOUS UNIFYING BATTERY ENERGY STORAGE SYSTEM DEMONSTRATION

The goals of this task are to: (1) Demonstrate HUB ESS performance for at least one year; and (2) Demonstrate automated operation and customer-oriented demonstration, to maximize use case benefit to the site host.

The Recipient shall:

- Demonstrate for at least one year the performance of HUB ESS. The demonstration will include planned testing routine of demand charge reduction, solar arbitrage, and critical load back up under simulated power outage.
- Demonstrate automated operation and customer-oriented demonstration, to maximize use case benefit to the site host.
- Prepare *Battery Planned Demonstration Data Report* to include cost and performance data based on objectives of, at minimum: demand charge reduction, solar arbitrage, and critical load back-up under simulated power outage.
- Prepare *Continuous End-user Defined Demonstration Data Report* that includes performance and cost data based on the automated operation determined by the customer (site's) objective (demand charge reduction, solar arbitrage, and critical load back-up).
- Prepare *CPR Report #1* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products:

- Battery Planned Demonstration Data Report
- Continuous End-user Defined Demonstration Data Report
- CPR Report #1

TASK 7: TESTING AND DEMONSTRATION RESULT ANALYSIS

The goal of this task is to evaluate system benefit and economic potentials in a wide range of California-based applications by utilizing multiple ESS valuation tools.

The Recipient shall:

- Perform test result evaluation.
- Provide *Demonstration Assessment Report* assessing demonstration result and benefit to the site host.
- Prepare *System Performance Report* on system performance, providing suggested technology improvements.
- Document battery aging test model and prepare *Battery Aging Test Report* on laboratory aging test and derived degradation model for life cycle optimization
- Prepare *CPR Report #2* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

EXHIBIT A Scope of Work

Products:

- Demonstration Assessment Report
- System Performance Report
- Battery Aging Test Report
- CPR Report #2

TASK 8: 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.

EXHIBIT A

Scope of Work

- 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 9: 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.

EXHIBIT A

Scope of Work

- 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)

TASK 10: PRODUCTION READINESS PLAN

The goal of this task is to determine the steps that will lead to the manufacturing of technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:
 - Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
 - Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."
 - The estimated cost of production.
 - The expected investment threshold needed to launch the commercial product.
 - An implementation plan to ramp up to full production.
 - The outcome of product development efforts, such as copyrights and license agreements.
 - Patent numbers and applications, along with dates and brief descriptions.
 - Other areas as determined by the CAM.

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

To: Office of Planning and Research
 PO Box 3044
 1400 Tenth Street, Room 113
 Sacramento, CA 95812-3044

From: California Energy Commission
 1516 Ninth Street, MS-48
 Sacramento, CA 95814

Project Applicant: Smartville, Inc.

Project Title: Low-Cost and Easy-to-Integrate Second-Life Battery HUB

Project Location – Specific: UC San Diego Trade Street Warehouse, 7835 Trade St., Suite 400

Project Location – City: San Diego 92121 **Project Location – County:** San Diego

Description of Nature, Purpose and Beneficiaries of Project:

The proposed project would occupy approximately 400 square feet of concrete ramp in front of Loading Docks 20 and 21 at the UC San Diego Trade Street Warehouse. The proposed use of the area would be to install a battery energy storage system that would feed an existing electrical subpanel in Suite 200. Minor trenching in an existing concrete area would be required for installation of electrical conduit. The battery system would operate from Q2 2021 to Q2 2023, after which the system would be removed and the site would be returned to original condition.

Name of Public Agency Approving Project: California Energy Commission

Name of Person or Agency Carrying Out Project: Smartville, Inc. & The Regents of the University of California;
 University of California San Diego

Exempt Status: *(check one)*

- Ministerial Exemption (Pub. Resources Code § 21080(b)(1); Cal. Code Regs., tit 14, § 15268);
- Declared Emergency (Pub. Resources Code § 21080(b)(3); Cal. Code Regs., tit 14, § 15269(a));
- Emergency Project (Pub. Resources Code § 21080(b)(4); Cal. Code Regs., tit 14, § 15269(b)(c));
- Categorical Exemption. State type and section number
Cal. Code Regs., tit 14, § 15304
- Statutory Exemptions. State code number.
- Common Sense Exemption. (Cal. Code Regs., tit 14, §15061(b)(3))

Reasons why project is exempt:

Class 4 projects consist of minor public or private alterations in the condition of land which do not involve the removal of healthy, mature, scenic trees. Based on the above project description, the proposed project is exempt under 14 CCR section 15304 Minor Alterations to Land. The proposed project consists of minor temporary use of land having no permanent effects on the environment and minor trenching where the surface would be restored. In addition, none of the exceptions to the exemptions apply.

Responsible Agency

Contact Person: Elise Brown Ersoy **Area code/Telephone/Ext:** 916-327-1367

If filed by applicant:

1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? Yes No

Signature: _____

Date: _____

Title: _____

Signed by Responsible Agency

Signed by Lead Agency

Signed by Applicant

Date received for filing at OPR: _____

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: SMARTVILLE, 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-19-038 with Smartville, Inc. for a \$2,035,787 grant to characterize the degradation of repurposed electric vehicle battery modules and validate the ability of these resources to provide building resiliency and load shifting services. The goal is to allow multiple second-life battery form factors and module types, from multiple original equipment manufacturers, to be integrated and actively exchanged within a single system architecture; 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 Commission does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the CEC held on June 10, 2020.

AYE:

NAY:

ABSENT:

ABSTAIN:

Cody Goldthrite
Secretariat