



STATE OF CALIFORNIA

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 12/2019)

CALIFORNIA ENERGY COMMISSION

A) New Agreement # EPC-22-007 (to be completed by CGL office)

B) Division	Agreement Manager:	MS #	Phone
ERDD	Katelynn Dinius	43	916-776-3468

C) Recipient's Legal Name	Federal ID Number
Andromeda Power, LLC	47-1468964

D) Title of Project
Integrated Powertrain System - MotorTransformer

E) Term and Amount

Start Date	End Date	Amount
10/14/2022	3/31/2026	\$ 3,675,637

F) Business Meeting Information

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

Proposed Business Meeting Date 9/14/2022 ☐ Consent ☒ Discussion

Business Meeting Presenter Katelynn Dinius Time Needed: 5 minutes

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

Agenda Item Subject and Description:**Andromeda Power, LLC**

Proposed resolution approving Agreement EPC-22-007 with Andromeda Power, LLC for a \$3,675,637 grant to develop an advanced EV powertrain technology that enables fast bidirectional charging without costly off-vehicle equipment, and adopting staff's determination that this action is exempt from CEQA. The advanced EV powertrain will use the vehicle's electric motor to facilitate safe power conversion when the vehicle is parked and connected to the grid or to a building, reducing infrastructure complexity and enabling back-up power use cases. (EPIC funding) Contact: Katelynn Dinius.

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?

☒ Yes (skip to question 2)

☐ No (complete the following (PRC 21065 and 14 CCR 15378)):

Explain why Agreement is not considered a "Project":

2. If Agreement is considered a "Project" under CEQA:

a) ☒ Agreement **IS** exempt.

☐ Statutory Exemption. List PRC and/or CCR section number:

☒ Categorical Exemption. List CCR section number:

Cal. Code Regs., tit. 14, § 15301; Cal. Code Regs., tit. 14, § 15306

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

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Explain reason why Agreement is exempt under the above section: Cal. Code Regs., tit 14, sec. 15301 provides that projects that consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of existing or former use, are categorically exempt from the provisions of CEQA. The MotorTransformer and additional devices will be produced, integrated into a plug-in electric vehicle powertrain system, and connected to the existing microgrid at Andromeda Power's facility in Long Beach, CA. The project will be conducted at existing facilities and will have no significant effect on the environment and fits within section 15301.

Cal. Code Regs., tit 14, sec. 15306 provides that projects that consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource, are categorically exempt from the provisions of CEQA. This project will carry out applied research by implementing a new powertrain scheme for plug-in electric vehicles that adds isolated fast charging and discharging capability of its energy storage device directly from/to the grid and discharging to the building. The project will conduct basic data collection, research, and experimental management and will have no significant effect on the environment and fits within section 15301.

- 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
IXYS Long Beach, Inc.	\$ 95,000
PalPilot International Corporation	\$ 75,000
Coil Winding Specialist, Inc.	\$ 9,500
Verdek	(\$ 962,000 Match only)
TBD – Electrical	\$ 26,000
TBD - PEV Service	\$ 17,600
TBD - Mechanical Contractor	\$ 34,000
TBD - Electrical Engineering Consultant	\$ 27,000
TBD - Consultant	\$ 80



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Legal Company Name:	Budget
TBD - Manufacturing Support	\$ 86,000
TBD - Assembly	\$ 78,000
TBD - Fabrication Engineering	\$ 96,000
TBD - 3D Printing	\$ 75,000
TBD - Controls	\$ 98,000

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

Legal Company Name:

J) Budget Information

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	21-22	301.001I	\$3,675,637

R&D Program Area: EGRO: Transportation

TOTAL: \$3,675,637

Explanation for "Other" selection

Reimbursement Contract #: Federal Agreement #:

K) Recipient's Contact Information**1. Recipient's Administrator/Officer**

Name: Luigi Giubbolini

Address: 2500 Mira Mar Ave

City, State, Zip: Long Beach, CA 90815

Phone: 949-307-7519

E-Mail: luigi@andromedapower.com

2. Recipient's Project Manager

Name: Luigi Giubbolini

Address: 2500 Mira Mar Ave

City, State, Zip: Long Beach, CA 90815

Phone: 949-307-7519

E-Mail: luigi@andromedapower.com

L) Selection Process Used

- ☒ Competitive Solicitation #: GFO-21-303
- ☐ First Come First Served Solicitation #:
- ☐ Non-Competitive Bid Follow-on Funding (SB 115)



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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 | <input type="checkbox"/> Attached |
| 5. CEQA Documentation | <input type="checkbox"/> N/A | <input checked="" type="checkbox"/> Attached |

_____	_____
Agreement Manager	Date
_____	_____
Office Manager	Date
_____	_____
Deputy Director	Date

Exhibit A
Scope of Work
Andromeda Power, LLC

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR¹	Task Name
1		General Project Tasks
2	X	Plug-in Electric Vehicle Selection
3	X	MotorTransformer Production
4		Additional Devices Production
5	X	Powertrain System Integration
6		Demonstration of Integrated Powertrain System
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
AC	Alternating Current
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
CSS	Configuration Switch Set
DC	Direct Current
DR	Demand Response
DER	Distributed Energy Resource
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment (charger and/or discharger)
MC	Matrix Converter
PEV	Plug-in Electric Vehicle
SAE	Society of Automotive Engineers
V2B	Vehicle to Building

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the development and demonstration of the proposed Integrated Powertrain System technology. The Recipient will utilize a commercially available plug-in electric vehicle (PEV) modified and updated with the proposed technology to become capable of fast charging and discharging directly from the building alternating current (AC) power lines.

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

Exhibit A

Scope of Work

Andromeda Power, LLC

B. Problem/ Solution Statement

Problem

Currently, PEV fast charging and discharging is only possible by using off-board direct current (DC) electric vehicle supply equipment (EVSE) that is bulky and high cost (upwards of \$10,000). Because of its size, weight, and volume, DC EVSE cannot be installed onboard the PEVs. A new paradigm for the PEV fast charging and discharging approach is required to make the DC EVSE infrastructure obsolete, eliminating its complexity and cost barriers. This problem has not been addressed yet because PEV's current technology does not support fast charging and discharging directly from the grid.

Solution

The Recipient has developed a new powertrain scheme for a PEV that adds isolated fast charging and discharging capability of its energy storage device directly from/to the grid and discharging to the building. This PEV powertrain is accomplished by using the PEV motor(s) as a high-power isolation transformer(s) when the vehicle is parked and connected to the grid of the building. Thus, the technological advancement and breakthrough of the proposed project overcomes vehicle-to-building (V2B) barriers to achieving the state's statutory energy goals. The proposed powertrain scheme will not increase the weight, volume, and cost of the current PEV, and at the same time, eliminates the need for bulky off-board fast chargers and dischargers, dramatically reducing infrastructure complexity and cost.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Develop the Integrated Powertrain System.
- Mount the Integrated Powertrain System onboard a commercially available PEV.
- Test the modified PEV and demonstrate its capability for fast charging and discharging directly from the building's AC power lines (up to 133 kW limited by SAE J3068).

Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater grid reliability, low adoption costs, and increased grid safety by eliminating the need, cost, and installation of off-board DC EVSE to fast charge/discharge PEVs. The PEVs will be transformed into mobile energy storage devices capable of fast charging and discharging directly from/to the grid. This will enable the PEVs to act as a distributed energy resource (DER) for the grid without the need for an off-board energy storage device.

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).

Exhibit A Scope of Work Andromeda Power, LLC

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 developing a technology that enables a new series of V2B products. The project breakthrough is a new PEV powertrain scheme that adds isolated fast charging and discharging capability of its energy storage device directly from/to the grid. This PEV powertrain technological advancement is accomplished by using the PEV motor(s) in a novel way as a high-power isolation transformer(s) when the vehicle is parked and connected to the grid of the building. This proposed powertrain scheme does not increase the weight, volume, and cost of the current PEV, while eliminating the need for a bulky off-board fast charger and discharger, dramatically reducing infrastructure complexity and cost.

Agreement Objectives

The objectives of this Agreement are to:

- Design and build a MotorTransformer by modifying the motor of a commercially available PEV.
- Design and build the power electronics of the Integrated Powertrain System, including the onboard devices and offboard AC J3068 EVSE.
- Mount the Integrated Powertrain System onboard a commercially available PEV.
- Test the modified PEV in Driving Mode and V2B Mode for at least six months and verify that PEV performance is maintained after modification, including speed, acceleration, consumption, efficiency, etc.
- Connect to building micro-grid by the AC J3068 EVSE and collect charging and discharging data for each session, including power, energy, voltage, current, with DR and DER signals in time.

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. All products submitted which will be viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All technical tasks should include product(s). Products that require a draft version are indicated by marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, “**days**” means working days.

The Recipient shall:

Exhibit A Scope of Work Andromeda Power, LLC

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 California Energy Commission's (CEC) software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick.

The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

○ **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open-source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.

Exhibit A Scope of Work Andromeda Power, LLC

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

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other CEC staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The administrative portion of the meeting will include discussion of the following:

- Terms and conditions of the Agreement;
- Invoicing and auditing procedures;
- Administrative products (subtask 1.1);
- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
 - An updated Project Schedule;
 - Technical products (subtask 1.1);
 - Progress reports (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide *Kick-off Meeting Presentation* to include but not limited to:
 - Project overview (i.e., project description, goals and objectives, technical tasks, expected benefits, etc.)
 - Project schedule that identifies milestones
 - List of potential risk factors and hurdles, and mitigation strategy

Exhibit A
Scope of Work
Andromeda Power, LLC

- Provide an *Updated Project Schedule*, *Match Funds Status Letter*, and *Permit Status Letter*, as needed to reflect any changes in the documents.

The CAM shall:

- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

Recipient Products:

- Kick-off Meeting Presentation
- Updated Project Schedule (*if applicable*)
- Match Funds Status Letter (subtask 1.7) (*if applicable*)
- Permit Status Letter (subtask 1.8) (*if applicable*)

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the CEC, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a schedule for providing a Progress Determination on continuation of the project.

Exhibit A Scope of Work Andromeda Power, LLC

- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)

CAM Products:

- CPR Agenda(s)
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with CEC staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

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

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any procured equipment.
 - The CEC's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in the Agreement.

Exhibit A Scope of Work Andromeda Power, LLC

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Final 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 Funds and in-state expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Exhibit A

Scope of Work

Andromeda Power, LLC

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Energy Commission Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:
 - Cover page (**required**)
 - Credits page on the reverse side of cover with legal disclaimer (**required**)
 - Acknowledgements page (optional)
 - Preface (**required**)
 - Abstract, keywords, and citation page (**required**)
 - Table of Contents (**required**, followed by List of Figures and List of Tables, if needed)
 - Executive summary (**required**)
 - Body of the report (**required**)
 - References (if applicable)
 - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
 - Bibliography (if applicable)
 - Appendices (if applicable) (Create a separate volume if very large.)
 - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments* received on the Executive Summary. For each comment received, the recipient will identify in the summary the following:
 - Comments the recipient proposes to incorporate.
 - Comments the recipient does propose to incorporate and an explanation for why.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

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

CAM Product:

- Written Comments on the Draft Final Report

Exhibit A Scope of Work Andromeda Power, LLC

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of CEC funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the CEC awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

If match funds were a part of the proposal that led to the CEC awarding this Agreement, then provide in the letter:

- A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
 - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
 - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

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

Exhibit A

Scope of Work

Andromeda Power, LLC

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 each executed subcontract.

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- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

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

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

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

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
 - Technical area expertise;
 - Knowledge of market applications; or
 - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that insure a long-term perspective on decision-making and progress toward the project's strategic goals.

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

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

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- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:

- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings

The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:

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

The TAC shall:

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

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- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan.

Products:

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

Subtask 1.12 Project Performance Metrics

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

The Recipient shall:

- Complete and submit the project performance metrics from the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
 - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
 - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:

- TAC Performance Metrics Summary
- Project Performance Metrics Results

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TECHNICAL TASKS

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

TASK 2: PLUG-IN ELECTRIC VEHICLE SELECTION

The goal of this task is to evaluate available PEVs (Tesla, Nissan Leaf, and other possible options) to assess the ease of integrating the Integrated Powertrain System, thus minimizing the project risk and engineering design/modification time.

The Recipient shall:

- Conduct detailed analyses of the electrical schematics and mechanical/electrical layouts of the candidate PEVs to ensure selected vehicle meets the goals of this project in the allotted task timeframe.
- Select PEV to modify and create a *Comparative Study of Candidate PEVs* that includes but is not limited to the following:
 - Pros and cons comparative matrix of candidate PEVs.
 - List of required modifications for each PEV and evaluation of modification complexity.
 - Analysis and discussion of the comparative matrix and selection of the PEV for the project.
- Develop a *Selected PEV Modification Plan* that includes but is not limited to the following:
 - PEV electrical circuits to be modified for onboard Integrated Powertrain System installation.
 - PEV mechanical components to be modified for installation of the onboard Integrated Powertrain System.
 - Layout of electrical/mechanical integration of onboard Integrated Powertrain System.
 - Safety plan for integration of onboard Integrated Powertrain System, including personnel responsible, hazard analysis, and a description of how the Recipient will adhere to the most recent public guidelines/protocols for bidirectional PEV and EVSE projects.
- Prepare *CPR Report #1* and participate in a CPR meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- Comparative Study of Candidate PEVs (draft and final)
- Selected PEV Modification Plan (draft and final)
- CPR Report #1

TASK 3: MOTORTRANSFORMER PRODUCTION

The goals of this task are to modify the motor of the selected PEV and conduct testing in two modes: (1) vehicle-to-grid mode where the MotorTransformer functions as an isolation transformer between the energy storage device of the vehicle and AC power (micro)grid and (2) driving mode where MotorTransformer is operating as a standard electric vehicle motor. The motor coils will be electrically separated into two sets, and the unwinding/rewinding work and

Exhibit A Scope of Work Andromeda Power, LLC

mechanical tasks (such as adding internal taps) will be performed by a subcontractor specialized in electric transformer and motor manufacturing.

The Recipient shall:

- Design and build a MotorTransformer by modifying the electric motor of the selected PEV:
 - Disassemble the electric motor armature.
 - Install intermediate taps in the electric motor windings.
 - Reassemble the electric motor armature.
- Develop a *MotorTransformer Testing Plan* that includes but is not limited to the following:
 - Testing procedures
 - Testing conditions
 - Equipment used
 - Data to be collected
 - Safety precautions
- Test the MotorTransformer in the laboratory in the vehicle-to-grid and driving modes.
- Develop a *MotorTransformer Production Report* that includes but is not limited to the following:
 - The electrical circuit and layout of the MotorTransformer.
 - The mechanical layout of the MotorTransformer.
 - The MotorTransformer test results and analysis.
 - Discussion of problems encountered during design, assembly, and testing.
- Prepare *CPR Report #2* and participate in a CPR meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- MotorTransformer Testing Plan (draft and final)
- MotorTransformer Production Report (draft and final)
- CPR Report #2

TASK 4: ADDITIONAL DEVICES PRODUCTION

The goals of this task are to design, prototype, and test the required additional onboard devices, such as the configuration switch set (CSS), matrix converter (MC), controller (hardware and software), and the off-board AC SAE J3068 electric vehicle supply equipment (EVSE). The printed circuit boards and power sub-assembly harnesses for the Powertrain System Integration will be provided by subcontractors.

The Recipient shall:

- Design and build, the CSS prototype, MC prototype, controller (hardware and software), and AC SAE J3068 EVSE.
- Develop an *Additional Devices Testing Plan* that includes but is not limited to the following:
 - Testing procedures
 - Testing conditions
 - Equipment used
 - Data to be collected
 - Safety precautions

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- Test performance of the CSS prototype, MC prototype, controller (hardware and software), and AC SAE J3068 EVSE.
- Develop an *Additional Devices Production Report* that includes but is not limited to the following:
 - The electrical circuit, layout, and test results of the CSS.
 - The electrical circuit, layout, and test results of the MC.
 - The electrical circuit, layout, and test results of the controller.
 - The flowchart of the controller software.
 - The electrical circuit, layout, and test results of the AC J3068 EVSE.
 - The flowchart of the AC J3068 EVSE software.

Products:

- Additional Devices Testing Plan (draft and final)
- Additional Devices Production Report (draft and final)

TASK 5: POWERTRAIN SYSTEM INTEGRATION

The goal of this task is to install the Integrated Powertrain System on the selected PEV. The Integrated Powertrain System will be made up of the MotorTransformer, CSS, MC, controller, 3-phase high voltage contactors, and 3-phase AC SAE J3068 connector.

The Recipient shall:

- Install the Integrated Powertrain System.
 - Remove the original or preexisting high voltage DC contactors and AC isolated charger devices from the selected PEV.
 - Install MotorTransformer, CSS, MC, controller, 3-phase high voltage contactors, and 3-phase AC SAE J3068 connector on the selected PEV.
- Develop a *Powertrain System Integration Report* that includes but is not limited to the following:
 - The electrical circuit and layout of the Integrated Powertrain System installed on the selected PEV.
 - The mechanical layout of the Integrated Powertrain System installed on the selected PEV.
 - Challenges during integration.
 - Photos of the Integrated Powertrain System installed on the selected PEV.
- Prepare *CPR Report #3* and participate in a CPR meeting in accordance with subtask 1.3 (CPR Meetings).

Products:

- Powertrain System Integration Report (draft and final)
- CPR Report #3

TASK 6: DEMONSTRATION OF INTEGRATED POWERTRAIN SYSTEM

The goals of this task are to test and demonstrate the modified PEV with its Integrated Powertrain System.

The Recipient shall:

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- Test the modified PEV in driving mode to ensure proper performance and collect data (including, but not limited to, speed, acceleration, consumption, efficiency, etc.) during the testing duration of at least six months.
- Test the modified PEV in vehicle-to-grid mode connected to (micro)grid by the AC J3068 EVSE. Perform charging and discharging cycles and collect data (including, but not limited to, power, energy, efficiency, voltage, current, etc.) with DR and DER signals. ORCA-NET, Andromeda Power's EVSE networking cloud, communicates with the EVSE by OCPP 1.6 and with power utilities by Open Automated Demand Response 2.0b Profile Specification (OpenADR2.0b). ORCA-NET will be used to dispatch DR and DER signals to the AC J3068 EVSE to control energy direction, charging, and discharging power to/from the PEV. As the current version (2018) of the SAE J3068 standard does not support vehicle-to-grid, communication between EVSE and PEV controller will be implemented to control the direction and intensity of energy flow.
- Develop an *Integrated Powertrain System Test Plan* that includes but is not limited to:
 - Description of tests being conducted in driving mode and vehicle-to-grid mode, including, but not limited to, objectives, procedures, conditions, facilities, safety precautions, and equipment.
 - Critical metrics being validated in driving mode and vehicle-to-grid mode.
 - Measurement tools for verification including, but not limited to, DR and DER signals.
 - Communication protocols and standards being adhered to during testing.
 - Desired certifications including, but not limited to, UL and Rule 21.
- Develop a *Demonstration of Integrated Powertrain System Report* that includes but is not limited to:
 - High-level executive summary discussing:
 - Process and results of the final demonstration of the modified PEV.
 - Testing procedure of the modified PEV.
 - Technical issues experienced during the project.
 - Lessons learned during the project.
 - Opportunities to improve scale production.
 - Performance of the modified PEV in driving mode before and after the modification.
 - Fast charging and discharging performance of the modified PEV in vehicle-to-grid mode.

Products:

- Integrated Powertrain System Test Plan (draft and final)
- Demonstration of Integrated Powertrain System Report (draft and final)

TASK 7: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

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

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

Products:

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

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to conduct activities that will accelerate the commercial adoption of the technology being supported under this agreement. Eligible activities include, but are not limited to, the following:

- Scale-up analysis including manufacturing analysis, independent design verification, and process improvement efforts.
- Technology verification testing, or application to a test bed program located in California.
- Legal services or licensing to secure necessary intellectual property to further develop the technology
- Market research, business plan development, and cost-performance modeling.
- Entry into an incubator or accelerator program located in California.

The Recipient Shall:

- Develop and submit a *Technology Transfer Plan* (Draft/Final) that identifies the proposed activities the recipient will conduct to accelerate the successful commercial adoption of the technology.
- Present the *Draft Technology Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Technology Transfer Plan*. This document will identify:

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- TAC comments the recipient proposes to incorporate into the *Final Technology Transfer Plan*.
- TAC comments the recipient does not propose to incorporate with the *Final Technology Transfer Plan* and an explanation why those comments should not be incorporated.
- Submit the *Final Technology Transfer Plan* to the CAM for approval.
- Implement activities identified in the *Final Technology Transfer Plan*.
- Develop and submit a *Technology Transfer Summary Report* (Draft/Final) that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the *Final Technology Transfer Plan*. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the CEC.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre and post technology installation at the project sites or related project photographs.

Products:

- Technology Transfer Plan (Draft/Final)
- Summary of TAC Comments
- Technology Transfer Summary Report (Draft/Final)
- High Quality Digital Photographs

IV. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

STATE OF CALIFORNIA
STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Andromeda Power, LLC.

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-22-007 with Andromeda Power, LLC for a \$3,675,637 grant to develop an advanced EV powertrain technology that enables fast bidirectional charging without costly off vehicle equipment. The advanced EV powertrain will use the vehicle's electric motor to facilitate safe power conversion when the vehicle is parked and connected to the grid or to a building, reducing infrastructure complexity and enabling back-up power use cases; and

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

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the CEC held on September 14, 2022.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

Liza Lopez
Secretariat