

GRANTS/CONTINGENT AWARD REQUEST

CEC-270 (Revised 02/10)

CALIFORNIA ENERGY COMMISSION

To: Grants and Loans OfficeDate: 3/7/2013Project Manager: Rhett deMesaPhone Number: 916-327-1312Office: Energy Generation Research Office Division: Energy Research and Development MS- 43Project Title: Strategies for Sustainable and Cost-Effective Scale-up of Second-Life, Recycling, and DisposalPathways for PEV Battery Packs**Type of Request:** (check one)

<input checked="" type="checkbox"/> New Agreement: (include items A-F from below)	Agreement Number: <u>PIR-12-015</u>
Program: <u>PIER E / Transportation</u>	
Solicitation Name and/or Number: <u>PON-12-501-04 (Solicitation to Address High Purchase Costs and Disposal Impacts of Plug-in Electric Vehicle Battery Packs)</u>	
Legal Name of Recipient: <u>DOE- LAWRENCE BERKELEY NATIONAL LABORATORY</u>	
Recipient's Full Mailing Address: <u>1 CYCLOTRON RD</u> <u>BERKELEY, CA 94720-8099</u>	
Recipient's Project Officer: <u>Corinne Scown</u>	Phone Number: <u>(510)486-4507</u>
Agreement Start Date: <u>6/19/2013</u>	Agreement End Date: <u>3/31/2015</u>

<input type="checkbox"/> Amendment: (Check all that apply)	Agreement Number: _____
<input type="checkbox"/> Term Extension – New End Date: _____	
<input type="checkbox"/> Work Statement Revision (include Item A from below)	
<input type="checkbox"/> Budget Revision (include Item B from below)	
<input type="checkbox"/> Change of Scope (include Items A – F as applicable from below)	
<input type="checkbox"/> Other: _____	

ITEMS TO ATTACH WITH REQUEST:

A. Work Statement

B. Budget

C. Recipient Resolution, if applicable. (Resolution may be requested in Special Conditions if not currently available.)

D. Special Conditions, if applicable.

E. CEQA Compliance Form

F. Other Documents as applicable

- Copy of Score Sheets
- Copy of Pre-Award Correspondence
- Copy of All Other Relevant Documents

California Environmental Quality Act (CEQA)

<input type="checkbox"/> CEC finds, based on recipient's documentation in compliance with CEQA:	
<input type="checkbox"/> Project exempt: _____	NOE filed: _____
<input type="checkbox"/> Environmental Document prepared: _____	NOD filed: _____
<input type="checkbox"/> Other: _____	
<input checked="" type="checkbox"/> CEC has made CEQA finding described in CEC-280, attached	

Funding Information:

*Source #1: <u>PIER-E</u>	Amount: <u>\$ 250,290.00</u>	Statute: <u>11-</u>	FY: <u>12-13</u>	Budget List #: <u>501.027J</u>
*Source #2: _____	Amount: <u>\$</u>	Statute: _____	FY: _____	Budget List #: _____
*Source #3: _____	Amount: <u>\$</u>	Statute: _____	FY: _____	Budget List #: _____

If federally funded, specify federal agreement number: _____

* Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.

Business Meeting Approval: (refer to Business Meeting Schedule)Proposed Business Meeting Date: 5/8/2013 Consent DiscussionBusiness Meeting Participant: Rhett deMesaTime Needed: 5 minutes**Agenda Notice Statement:** (state purpose in layperson terms)Possible approval of a Grant / Contingent Award to...

Possible approval of this agreement with Lawrence Berkeley National Laboratory in the amount of \$250,290.00. Lawrence Berkeley National Laboratory will create large-scale recycling infrastructure scenarios for plug-in electric vehicle batteries and compare the potential life-cycle environmental implications of each. The length of this agreement is 21 months.

Project Manager

Date

Office Manager

Date

Deputy Director

Date

PIR-12-015
Lawrence Berkeley National Laboratory

Exhibit A WORK STATEMENT

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2	X	Recycling Infrastructure Development and Logistics Optimization

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Corinne Scown (LBNL) Jeffrey Greenblatt (LBNL)	N/A	N/A
2	Corinne Scown (LBNL) Jeffrey Greenblatt (LBNL) William Morrow (LBNL) Thomas McKone (LBNL)	N/A	Umicore, Nissan

GLOSSARY

Specific terms and acronyms used throughout this scope of work are defined as follows:

Term/ Acronym	Definition
ArcGIS	<i>A powerful geospatial mapping and analysis software package</i>
CPR	Critical Project Review
GHG	Greenhouse Gas
PEV	Plug Electric Vehicle
ZEV	Zero Emission Vehicle

Problem Statement:

Governor Brown's Executive Order B-16-2012 lays out an aggressive plan for encouraging the development and success of zero-emission vehicles in order to meet the state's greenhouse gas (GHG) emissions reduction goals. This ambitious plan to increase the market share of plug-electric vehicles (PEVs) in California relies on the ability of industry leaders to produce batteries that do not have prohibitively high upfront costs, achieve life-cycle costs competitive with conventional vehicles, and can be safely, sustainably, and cost-effectively managed at their end-of-life. Recycling is critical to avoiding increased solid waste generation, conserving constrained resources such as cobalt and nickel, and reducing the life-cycle energy and GHG footprint of PEV

manufacturing. Studies also indicate that recycling is necessary to avoid significant long-term increases in the cost and energy required for lithium extraction, and US reliance on foreign resources in Chile and Bolivia (Kushnir and Sandén, 2012; Wanger, 2011). The potential consequences of such price increases would exacerbate already high upfront costs associated with PEV batteries. However, recycling lithium-ion batteries is not yet economically attractive, largely because of the relative abundance and low cost of virgin lithium. Scientific and technological barriers must be overcome on the recycling process and logistics side to reduce costs, and market barriers must be overcome to ensure that the negative externalities associated with virgin material use are properly accounted for.

Goals of the Agreement:

The goal of this Agreement is to develop novel recycling scale-up strategies for scale-up of PEV battery recycling infrastructure in California to achieve economic and environmental sustainability. Additionally, ensuring that these strategies can be practically applied, and identifying key steps and potential barriers to implementing them in California.

Objectives of the Agreement:

The objectives of this Agreement are to develop one or more scenarios to estimate potential consumer adoption of PEVs in California and the resulting battery disposal rates, establish a set of cost and environmental metrics by which to compare battery recycling/reuse strategies, create optimal large-scale recycling infrastructure and logistics scenarios, and estimate the environmental implications for each recycling/reuse scenario. Results from the environmental assessment and infrastructure scenarios will be made available to guide future recycling process development in prioritizing particular materials, or taking steps to reduce transportation and capital costs, such as the ability to recycle multiple battery types in a single facility.

TASK 1 ADMINISTRATION

Instructions for Submitting Electronic Files and Developing Software

Electronic File Format

The Recipient will deliver an electronic copy (CD ROM or memory stick or as otherwise specified by the Commission Project Manager (CPM) of the full text of any Agreement products in a compatible version of Microsoft Word (.doc).

The following describes the accepted formats of electronic data and documents provided to the Energy Commission as products and establishes the computer platforms, operating systems, and software versions that will be required to review and approve all software deliverables.

- Data sets will be in Microsoft (MS) Access or MS Excel file format.
- PC-based text documents will be in MS Word file format.
- Documents intended for public distribution will be in PDF file format, with the native file format provided as well.
- Project management documents will be in MS Project file format.

Software Application Development

If this Scope of Work includes any software application development, including but not limited to databases, websites, models, or modeling tools, the Recipient will use the following standard Application Architecture components in compatible versions:

- Microsoft ASP.NET framework (version 3.5 and up) Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up) Recommend 2010.
- C# Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures Recommend 2008 R2.
- Microsoft SQL Reporting Services Recommend 2008 R2
- XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the Energy Commission's Information Technology Services Branch.

Task 1.1 Attend Kick-off Meeting

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

The Recipient shall:

- Attend a "Kick-Off" meeting with the CPM, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the CPM to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the CPM will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6) *No work may be performed until this documentation is in place.*
- Permit documentation (Task 1.7)
- Discussion of subcontracts needed to carry out project (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The CPM's expectations for accomplishing tasks described in the Scope of Work

- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)
- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of the Final Report (Task 1.5)

The CPM shall designate the date and location of this meeting.

- Submit an updated Schedule of Products, List of Match Funds, and List of Permits to the CPM.

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Commission Project Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule, or budget.

CPRs provide the opportunity for frank discussions between the CPM and the Recipient. The CPM may schedule CPRs as necessary, and CPR costs will be borne by the Recipient.

Participants include the CPM and the Recipient, and may include the Commission Grants Officer, the Energy Research and Development Division technical lead, other Energy Commission staff and Management, and any other individuals selected by the CPM to provide support to the Energy Commission.

The Commission Project Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These 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 Commission Project Manager.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion of both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.

- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. If the CPM 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 written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more products that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work on the project. This report shall be submitted along with any other products identified in this Scope of Work. The Recipient shall submit these documents to the CPM and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Commission Project Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)

Task 1.3 Final Meeting

The goal of this task is to close out this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present the project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Commission Grants Office Officer, and the CPM. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the discretion of the CPM.

The technical portion of the meeting shall involve the presentation of an assessment of the degree to which project and task goals and objectives were achieved, in addition to findings, conclusions, recommended next

steps (if any) for the Agreement, and recommendations for improvements. The CPM will determine the appropriate meeting participants.

The administrative portion of the meeting shall involve a discussion with the CPM and the Grants Officer about the following Agreement closeout items:

- Disposition of any equipment purchased with Energy Commission funds
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions
- Final invoicing and release of retention
- Prepare written documentation of any agreements made between the Recipient and Commission staff during the meeting.
- Prepare a schedule for completing the closeout activities for this Agreement.

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities

Task 1.4 Monthly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

The Recipient shall:

- Prepare a Monthly Progress Report that summarizes all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the CPM within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in the Terms and Conditions of this Agreement.
- In each Monthly Progress Report and invoice, document and verify:
 - Energy Commission funds received by California-Based Entities (CBEs);
 - Energy Commission funds spent in California; and Match fund expenditures
 - Provide synopsis of project progress.

Product:

- Monthly Progress Reports

Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The objectives of the Final Report are to clearly and completely describe the project's purpose, approach, activities performed, results, and advancements in science and technology; to present a public assessment of the success of the project as measured by the degree to which goals and objectives were achieved; to make insightful observations based on results obtained; to draw conclusions; and to make recommendations for further projects and improvements.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will also prepare a confidential version of the Final Report, the Recipient shall perform the following activities for both the public and confidential versions of the Final Report.

The Recipient shall:

- Prepare an Outline of the Final Report.
- Prepare a Final Report following the approved outline and the latest version of the Final Report guidelines which will be provided by the CPM. The CPM shall provide written comments on the Draft Final Report within 15 working days of receipt. The Final Report must be completed at least 90 days before the end of the Agreement Term.
- Submit one bound copy of the Final Report with the final invoice.

Products:

- Draft Outline of the Final Report
- Final Outline of the Final Report
- Draft Final Report
- Final Report

Task 1.6 Identify and Obtain Match Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the Energy Commission budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of Energy Commission funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the CPM at least 2 working days prior to the kick-off meeting. 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 such 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 each cash match fund, its source (including a contact name, address and telephone number), and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, its 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 shall identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured. For match funds provided by a grant a copy of the executed grant shall be submitted in place of a letter of commitment.
- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. 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 letter including the appropriate information to the CPM if during the course of the Agreement additional match funds are received.
- Provide a letter to the CPM within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Products:

- A letter regarding match funds or stating that no match funds are provided
- Copy(ies) of each match fund commitment letter(s) (if applicable)
- Letter(s) for new match funds (if applicable)
- Letter that match funds were reduced (if applicable)

Task 1.7 Identify and Obtain Required Permits

The goal of this task 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. Although the Energy Commission budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditure for which a permit is required.

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the CPM at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions or lead agencies
 - The schedule the Recipient will follow in applying for and obtaining these permits.
- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule, and copies of the permits. The implications to the Agreement 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 the Progress Reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, provide an updated list of permits (including the appropriate information on each permit) and an updated schedule to the CPM.
- As permits are obtained, send a copy of each approved permit to the CPM.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CPM within 5 working days. Either of these events may trigger an additional CPR.

Products:

- Letter documenting the permits or stating that no permits are required
- Updated list of permits as they change during the term of the Agreement (if applicable)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)
- A copy of each approved permit (if applicable)

Task 1.8 Obtain and Execute Subcontracts

The goal of this task is to ensure quality products and to procure subcontracts required to carry out the tasks under this Agreement consistent with the terms and conditions of this Agreement and the Recipient's own procurement policies and procedures. This task will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, and that the budgeted expenditures are reasonable and consistent with applicable cost principles.

The Recipient shall:

- Manage and coordinate subcontractor activities.
- Submit a draft of each subcontract required to conduct the work under this Agreement to the Commission Agreement Manager for review.
- Submit a final copy of the executed subcontract.
- If the Recipient decides to add new subcontractors, it shall notify the Commission Agreement Manager.

Products:

- Draft subcontracts
- Final subcontracts

TECHNICAL TASKS

TASK 2: RECYCLING INFRASTRUCTURE DEVELOPMENT AND LOGISTICS OPTIMIZATION

The goals of this task are to create scenarios for consumer adoption of PEVs and the resulting battery disposal rates to feed into the development of optimal large-scale recycling infrastructure and logistics scenarios, and then compare life-cycle implications of each scenario.

The Recipient shall:

- Develop a set of the most promising or likely PEV battery market adoption scenarios including a range of expectations regarding the number, chemistries, and sizes of PEV batteries requiring recycling or disposal in the short (2015-2020), medium (2030), and long term (2050) in California, as well as the geographic distribution of these used batteries.
- Develop a set of the most promising or likely PEV battery recycling process scenarios for California and strategies for minimizing infrastructure and transportation-related costs, as well as environmental impacts.
- Prepare and provide a report entitled “Plug-Electric Vehicle Market Adoption and Battery Recycling Demand Scenarios for California.” The report will include, but is not limited to, estimates of the number, chemistries, and sizes of PEV batteries requiring recycling or disposal between 2015 and 2050 in California, as well as the geographic distribution of these batteries.
- Develop an internal ArcGIS (a powerful geospatial mapping and analysis software package)-based cost and environmental impact model that determines optimal battery collection methods, potential second life, and recycling facilities, as subject to siting constraints, and subsequently calculates optimal transportation distances and mode choices. Work with Umicore and Nissan Corporation to ensure that the cost assumptions for capital, operations, and transportation are realistic.
- Incorporate probabilistic elements into ArcGIS-based cost and environmental model to account for uncertainties in PEV deployment and battery disposal scenarios.
- Prepare and provide a report entitled “Plug-Electric Vehicle Batteries Recycling Strategies for California.” The report will include, but is not limited to, a geographically-based assessment of costs and environmental impacts of optimal battery collection methods, potential second life, and recycling facilities, including optimal transportation distances and mode choices, and assessment of uncertainties.

Products:

- Draft Report: Plug-Electric Vehicle Market Adoption and Battery Recycling Demand Scenarios for California

- Final Report: Plug-Electric Vehicle Market Adoption and Battery Recycling Demand Scenarios for California
- Draft Report: Plug-Electric Vehicle Batteries Recycling Scale-Up Strategies for California
- Final Report: Plug-Electric Vehicle Batteries Recycling Scale-Up Strategies for California



Award Number: PIR-12-015

Date: 3 / 7 / 2013

Note: The Energy Commission Project Managers Manual includes detailed instructions on how to complete this section, with examples of grants that are “Projects” and are not “Projects”. When the Project Manager is completing this section, if questions arise as to the appropriate answers to the questions below, please consult with the Energy Commission attorney assigned to review grants or loans for your division.

1. Is grant/loan considered a “Project” under CEQA? Yes (skip to question #2) No (continue with question #1)

Please complete the following: [Public Resources Code (PRC) 21065 and 14 California Code of Regulations (CCR) 15378]:

Explain why the grant/loan is **not** considered a “Project”? The grant/loan will not cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because grant/loan involves:

Grant agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because the study is limited to information gathering, laboratory measurements, calculations, and interpretation.

2. If grant/loan is considered a “Project” under CEQA: (choose either **IS** or **IS NOT**)

Grant/loan **IS** exempt:

Statutory Exemption: (List PRC and/or CCR section numbers) _____

Categorical Exemption: (List CCR section number) _____

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

Explain reason why the grant/loan is exempt under the above section:

Please attach draft Notice of Exemption (NOE). Consult with the Energy Commission attorney assigned to your division for instructions on how to complete the NOE.

Grant/loan **IS NOT** exempt. The Project Manager needs to consult with the Energy Commission attorney assigned to your division and the Siting Office regarding a possible initial study.