



To: Grants and Loans Office

Date: 8 / 20 / 2012

Project Manager: Darren Nguyen

Phone Number: (916) 654-5144 ext.

Office: EFTO

Division: FTD

MS- 27

Project Title: Expansion of Battery Management System Integration Facilities for Lithium Ion Battery Modules

**Type of Request:** (check one)

**New Agreement:** (include items A-F from below) Agreement Number: Assigned by the G&L Office

Program: Alternative and Renewable Fuel and Vehicle Technology Program

Solicitation Name and/or Number: PON 11-604

Legal Name of Recipient: Quallion LLC

Recipient's Full Mailing Address: 12744 San Fernando Road, Sylmar, CA 91342

Recipient's Project Officer: Alex Fay Phone Number: (818) 833-2029 ext.

Agreement Start Date: 11 / 15 / 2012 Agreement End Date: 12 / 31 / 2014

**Amendment:** (Check all that apply) Agreement Number: ARV-12-010

Term Extension – New End Date:  / /

Work Statement Revision (include Item A from below)

Budget Revision (include Item B from below)

Change of Scope (include Items A – F as applicable from below)

Other: (Specify)

**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)**

CEC finds, based on recipient's documentation in compliance with CEQA:

Project exempt: Section § 15301 NOE filed:  / /

Environmental Document prepared: Type NOD filed:  / /

Other: \_\_\_\_\_

CEC has made CEQA finding described in CEC-280, attached

**Funding Information:**

\*Source #1: ARFVTP Amount: \$ 2,230,595 Statute: \_\_\_\_\_ FY: \_\_\_\_\_ Budget List #: \_\_\_\_\_

\*Source #2: \_\_\_\_\_ Amount: \$ Statute: \_\_\_\_\_ FY: \_\_\_\_\_ Budget List #: \_\_\_\_\_

\*Source #3: \_\_\_\_\_ Amount: \$ 0.00 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: 10 / 10 / 2012  Consent  Discussion

Business Meeting Participant: Darren Nguyen Time Needed: (5 minutes)

**Agenda Notice Statement:** (state purpose in layperson terms)

Possible approval of a  Grant /  Contingent Award to...

Quallion, LLC for \$2,230,595 to expand its manufacturing capacity for high volume integration of battery management system (BMS) electronics into electric vehicle batteries. Quallion proposes to acquire new electronics assembly and test equipment, modify and expand its existing facilities, and optimize the process of battery electronics integration. (continued on next page)

Project Manager \_\_\_\_\_ Date \_\_\_\_\_ Office Manager \_\_\_\_\_ Date \_\_\_\_\_ Deputy Director \_\_\_\_\_ Date \_\_\_\_\_

RESOLUTION NO: [XX-XXXX-XX]

STATE OF CALIFORNIA

STATE ENERGY RESOURCES  
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION REGARDING: GRANT AWARD  
TO  
QUALLION LLC  
UNDER PON-11-604

**RESOLVED**, that the State Energy Resources Conservation and Development Commission (Energy Commission) approves **Grant Award # ARV-12-010** with Quallion LLC (Recipient) for **\$2,230,595.00** to expand its manufacturing capacity, improve safety, and integrate advanced battery management system (BMS) electronics technologies to improve the performance of electric vehicle batteries.

**WHEREAS**, the Energy Commission finds that the activities funded by this grant are a “project” under the California Environmental Quality Act (CEQA) and categorically exempt from further environmental review pursuant to the “existing facility” exemption under CEQA Guidelines, § 15301.

**FURTHER BE IT RESOLVED**, that this document authorizes the Executive Director or his/her designee to execute the same on behalf of the Energy Commission.

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 California Energy Commission held on **October 10, 2012**:

AYE: [*List Commissioners*]

NAY: [*List Commissioners*]

ABSENT: [*List Commissioners*]

ABSTAIN: [*List Commissioners*]

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*Harriet Kallemeyn,*  
*Secretariat*

## EXHIBIT A SCOPE OF WORK

### TECHNICAL TASK LIST

Task #	Task Name
1	Administration
2	Equipment Design, Procurement, Build and Delivery
3	Electronics Workstation Enhancement
4	Equipment Validation
5	Produce and Test Sample Electronics Assemblies

### KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Alex Fay, Program Manager Vince Visco, Vice President Paul Beach, President		
2	Ramiro Perez, Elec. Engineer Michael Lee, Elec. Engineer		
3	Ramiro Perez Michael Lee Jerry Grissom, Facilities Lead	Construction Subcontractor TBD	
4	Ramiro Perez Michael Lee		
5	Ramiro Perez Michael Lee Bruce McLees, Quality Engineer		

### GLOSSARY

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

Term/ Acronym	Definition
ARFVT	Alternative and Renewable Fuel and Vehicle Technology
BMS	Battery Management System
CPR	Critical Project Review
Commission	Energy Commission
FTD	Fuels and Transportation Division
GHG	Greenhouse Gas
PCB	Printed Circuit Board

### Background:

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007), created the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVT Program). The statute,

subsequently amended by AB 109 (Núñez, Chapter 313, Statutes of 2008), authorizes the Energy Commission to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The Energy Commission has an annual program budget of approximately \$100 million and provides financial support for projects that:

- Develop and improve alternative and renewable low-carbon fuels;
- Optimize alternative and renewable fuels for existing and developing engine technologies;
- Produce alternative and renewable low-carbon fuels in California;
- Decrease, on a full fuel cycle basis, the overall impact and carbon footprint of alternative and renewable fuels and increase sustainability;
- Expand fuel infrastructure, fueling stations, and equipment;
- Improve light-, medium-, and heavy-duty vehicle technologies;
- Retrofit medium- and heavy-duty on-road and non-road vehicle fleets;
- Expand infrastructure connected with existing fleets, public transit, and transportation corridors; and
- Establish workforce training programs, conduct public education and promotion, and create technology centers.

On February 6, 2012, the California Energy Commission released a Grant Solicitation and Application Package, PON-11-604 to provide funding opportunities under the ARFVT Program. This competitive grant solicitation was an offer to cost-share the development of manufacturing and/or assembly facilities in California that produce alternative fuel vehicles, advanced technology vehicles, and/or eligible vehicle components.

In response to solicitation PON-11-604, Quallion submitted application #7 which was proposed for funding in the Energy Commission's Revised Notice of Proposed Awards released on June 20, 2012. Both solicitation PON-11-604 and the Recipient's proposal are incorporated herein by reference to this Agreement in their entirety.

In the event of any conflict or inconsistency between the terms of the Solicitation and the terms of the Recipient's Application, the Solicitation shall control. In the event of any conflict or inconsistency between the Recipient's Application and the terms of Commission's Award, the Commission's Award shall control. Similarly, in the event of any conflict or inconsistency between the terms of this Agreement and the Recipient's Application, the terms of this Agreement shall control.

### **Problem Statement:**

Lithium ion batteries are crucial components to electric vehicles, and they require battery management system (BMS) electronics to operate safely and meet the performance needs and pricing targets of electric vehicles. The BMS monitors various parameters of battery operation and controls the functions of the battery to ensure safety and optimal performance. The BMS is especially important in distributing power

evenly in large battery packs composed of many individual lithium ion cells and modules, like those used in electric vehicles. The high voltage (>300V) requirements of electric vehicles impose unique demands on the design and production of BMS electronics. Currently, BMS systems are inadequate to meet the needs of high voltage battery requirements. These applications use small, low voltage batteries and do not require the same accuracy or precision in control of charge and discharge, prediction of state of charge, and prediction of state of health that is required for larger electric vehicle systems. Small market BMS can only provide for low voltage (<50V) batteries and cannot handle high voltage battery demand.

The commercial market for lithium ion batteries is dominated by the consumer electronics industry. But there is opportunity for significant improvement of the battery through advanced BMS electronics to be cost competitive with internal combustion engine vehicles. The advanced BMS electronics can contribute to improved safety of electric vehicle batteries, helping to alleviate legitimate concerns of potential EV customers. Advances in lithium ion BMS technology are needed in order to enable widespread deployment of electric vehicles and reduce pollution and GHG emission targets in California. Quallion has significant technical experience with advanced BMS design and production, but the company has limited facilities and equipment to scale up production capacity to incorporate these advances into its batteries to meet the needs of the growing electrified transportation market.

### **Goals of the Agreement:**

The goal of this Agreement is to enhance Quallion's capacity to design, produce, and test advanced lithium ion BMS electronics and to incorporate these electronics into modules and batteries in California to meet the growing demands for electric vehicle applications. This project seeks to match Quallion's extensive intellectual property and technical know-how related to lithium ion BMS with appropriately scaled facilities that will expand the company's production capacity for larger vehicle systems. This project also seeks to address a bottleneck in Quallion's production process wherein the company's capacity to produce lithium ion cells and modules is outgrowing its capacity to develop and integrate BMS electronics to make complete battery systems.

### **Objectives of the Agreement:**

The objectives of this Agreement are to:

- Establish the feasibility of a high voltage, high throughput electronics facility.
- Support Quallion's new automated cell and module manufacturing lines with an enhanced electronics facility.
- Determine trade-offs among cost, capacity, performance, and reliability of equipment used for electronics design, testing, production, and integration into battery packs.
- Quantify the environmental benefits of incorporating advanced BMS electronics in green technology applications, such as electric and hybrid vehicles.

## **TASK 1 ADMINISTRATION**

### **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 Commission Project Manager, 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 Commission Project Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Project Manager 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).
- 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 Commission Project Manager’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 Commission Project Manager shall designate the date and location of this meeting.

#### **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 Energy Commission and the Recipient. The Commission Project Manager may schedule CPRs as necessary, and CPR costs will be borne by the Recipient.

Participants include the Commission Project Manager and the Recipient and may include the Commission Grants Officer, the Fuels and Transportation Division (FTD) team lead, other Energy Commission staff and Management as well as other individuals selected by the Commission Project Manager 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.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on 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 continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see section 8 of the Terms and Conditions). If the Commission Project Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Transportation Committee for its concurrence.
- 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 product(s) 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 of the projects. This report shall be submitted along with any other products identified in this scope of work. The Recipient shall submit these documents to the Commission Project Manager 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 closeout this Agreement.

**The Recipient shall:**

- Meet with Energy Commission staff to present the 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 Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Project Manager.

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Commission Project Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Project Manager and the Grants Officer about the following Agreement closeout items:

- What to do with any equipment purchased with Energy Commission funds (Options)
- 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 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 which 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 Commission Project Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in Section 6 of the Terms and Conditions of this Agreement.
- In the first Monthly Progress Report and first invoice, document and verify match expenditures and provide a synopsis of project progress, if match funds have been expended or if work funded with match share has occurred after the notice of proposed award but before execution of the grant agreement. If no match funds have been expended or if no work funded with match share has occurred before execution, then state this in the report. All pre-execution match expenditures must conform to the requirements in the Terms and Conditions of this Agreement.

**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 to the FTD project management processes.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, 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 Commission Project Manager. The Commission Project Manager shall provide written comments on the Draft Final Report within fifteen (15) working days of receipt. The Final Report must be completed at least 60 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 Matching Funds**

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for 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

**The Recipient shall:**

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Project Manager 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, and 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 and 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 the appropriate information to the Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Project Manager 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 Commission Project Manager 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 the 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 the appropriate information on each permit and an updated schedule to the Commission Project Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Project Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Project Manager 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
- A copy of each approved permit (if applicable)
- 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)

**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. It will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, 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 Recipient decides to add new subcontractors, it shall notify the Commission Agreement Manager.

**Products:**

- Draft subcontracts
- Final subcontracts

**TECHNICAL TASKS**

**TASK 2 - EQUIPMENT DESIGN, PROCUREMENT, BUILD AND DELIVERY**

The goal of this task is to plan and order electronics design, production, and test equipment specific to Recipient's BMS technology, to plan a facility layout that accommodates efficient workflow, enhances inventory control and expedites assembly processes, and to track supplier progress as new equipment is produced.

**The Recipient shall:**

- Select suppliers to produce and design new equipment. Evaluate potential suppliers on basis of reliability, company stability, initial cost estimate, and timelines.
- Work with selected suppliers to design equipment required for electronics facility, factoring in process, space, electricity consumption and potential building modifications and limitations.
- Lay out facility floor plan based on expected equipment developed for the electronics workstations. Take into account power supplies for equipment, order of assembly and testing process, ventilation, environmental codes, employee safety regulations, etc.
- Revise equipment design and/or facility layout as needed.
- Review equipment design. Perform a comprehensive review of equipment designed, planned facility layout, and revised quote.
- Issue equipment Purchase Order (PO) for equipment build to supplier.
- Monitor supplier equipment build progress post issuance of PO. Review progress on monthly basis to determine if build is on schedule, within cost, and to evaluate any technical difficulties.
- If necessary, revise and change equipment per technical challenges that may have arisen – in the case this occurs, a revision of facility layout may be necessary.
- Report any significant modifications, delays, or discrepancy in cost to CPM as it occurs.

- Inspect completed equipment at supplier site pre-shipping. Check equipment sizing versus blueprint and basic operability.
- Have equipment shipped and receive at facility.
- Include the above information in the monthly progress reports.
- Prepare and submit an Equipment and Facility summary report on Task 2 activities, including facility layout plan, descriptions of the equipment installations, electronics lab protocol, and the ability of the lab to operate in conjunction with automated cell and module manufacturing processes.

**Products:**

- Equipment and Facility Summary Report

**TASK 3 ELECTRONICS WORKSTATION ENHANCEMENT**

The goals of this task are to expand the electronics workstations, enhance their function within an environmentally controlled area, and install and integrate new equipment into the workstations.

**The Recipient shall:**

- Modify workstations as needed to allow for proper layout of new equipment.
- Install new equipment, per layout determined in Task 2. Equipment to be placed, assembled, and connected as required – assistance from the equipment supplier may be needed.
- Integrate new equipment to create a series of workstations for the aspects of electronics design, development, production and testing.
- Optimize the production process for integration of BMS electronics with modules and complete batteries including final testing of batteries with integrated BMS.
- Prepare and submit Electronics Workstations Enhancement summary report on Task 3, including confirmation of equipment installation, difficulties encountered and solutions.

**Products:**

- Electronics Workstations Enhancement Summary Report

**TASK 4 EQUIPMENT VALIDATION**

The goal of this task is to validate that the equipment and facility improvements can perform to their specifications.

**The Recipient shall:**

- Operate each piece of equipment to ensure product is as desired (for example, printed circuit boards align properly on the batteries to which they are matched).
- Test each equipment item to ensure each piece works individually.
- Setup and run equipment as a system to evaluate for required transitions between stations. This may be an iterative process of testing and re-configuring details.
- Assure BMS electronics can be designed, developed, produced, and tested using the new equipment and facilities.
- Prepare and submit an Equipment Validation Summary Report on Task 4 including descriptions of the operation of each individual component and the lab as a system.

**Products:**

- Equipment Validation Summary Report

**TASK 5 PRODUCE AND TEST SAMPLE ELECTRONICS ASSEMBLIES INTEGRATED WITH BATTERIES**

The goal of this task is to validate that the equipment built and installed produces the desired BMS electronics assemblies and can integrate them into battery packs by testing these products against established standards.

**The Recipient shall:**

- Develop and submit a test plan to validate the BMS electronics and integrated battery packs produced in the facility. Testing shall include performance characterization, environmental testing, and safety testing. The Test plan shall:
  - establish a control using Quallion standard BMS assemblies and existing complete battery packs
  - determine how many units are to be tested for each type of testing
  - determine how many control samples are mandated.
- Define standard deviations for key-metrics for electronics produced and variance tolerances for metrics vs. standards of reference.
- Use completed facility to design and produce BMS electronics integrated with modules for testing purposes.
- Test electronics according to test plan, analyze test results, and compare with standard references.
  - If results are within tolerances and acceptances, process is complete.
  - If results indicate significant, unacceptable variation, fine tune the equipment, produce new units, and test new units until products fall within definitions:

- Fine tune equipment if BMS testing yields results indicating a discrepancy between test units and standard references.
  - Produce new units for testing from the re-aligned pilot line.
  - Test modules and analyze data.
- Prepare and submit Sample BMS Electronics Summary Report, including testing results, comparison of test BMS units with standard units, and equipment modifications made in response to test.

**Products:**

- Sample BMS Electronics Test Plan
- Sample BMS Electronics Summary Report

**Task 6 Data Collection and Analysis**

The goal of Task 6 is to collect and analyze data on produced batteries for a minimum of two months and to show the benefits that these batteries yield as a result of implementing them into electric vehicles.

**The Recipient shall:**

- Provide performance data and results for batteries tested.
- Provide any actual results, in terms of gasoline or diesel fuel displaced.
- Describe how the project provided economic benefits to California.
- Provide data to show the project demonstrated the cost-effectiveness of the BMS in achieving greenhouse gas emissions reduction.

**Products:**

- None. Data from this task shall be included in the Final Report.