

GRANT REQUEST FORM (GRF)CEC-270 (Revised 10/2015)
COMMISSION

CALIFORNIA ENERGY

New Agreement EPC-18-012 (To be completed by CGL Office)

Division	Agreement Manager:	MS-	Phone
ERDD	Benson Gilbert	51	916-445-5406

Recipient's Legal Name	Federal ID Number
Primus Power Corporation	20-8391437

Title of Project
Production Scale-Up of Low-Cost, Long-Life Flow Battery

Term and Amount	Start Date	End Date	Amount
	6/28/2019	3/31/2023	\$ 4,000,000

Business Meeting Information

<input type="checkbox"/> ARFVTP agreements under \$75K delegated to Executive Director.			
Proposed Business Meeting Date	6/12/2019	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Benson Gilbert	Time Needed:	5 minutes
Please select one list serve. EPIC (Electric Program Investment Charge)			

Agenda Item Subject and Description

PRIMUS POWER CORPORATION. Proposed resolution approving Agreement EPC-18-012 with Primus Power Corporation for a \$4,000,000 grant to increase Primus' manufacturing capacity of the Primus Power EnergyPod 2, a zinc bromide flow battery that offers energy storage with an estimated five hours of continuous output at 25 kW, a useful life of 20 years, no electrode stack replacement, and a non-flammable electrolyte, and adopting staff's determination that this action is exempt from CEQA.

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. (Attach draft NOE)
 Statutory Exemption. List PRC and/or CCR section number: _____
 Categorical Exemption. List CCR section number: Cal. Code Regs., tit. 14, § 15301
 Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why Agreement is exempt under the above section:
 The grant project activities will include design of, and scaling up of, Primus' existing, initial production line to a pilot production line, followed by scale-up to Low Rate Initial Production. To scale-up, Primus will add equipment and chemicals to its existing production line at a light-industrial facility in Hayward, California. Equipment to be added includes, for example, injection mold equipment, pick-and-place robotics, and a "clean room." These additions are a minor alteration of existing private facilities and mechanical equipment. (Parts suppliers will also add equipment at their existing facilities.) The nature of the manufacturing and the types of chemicals used will not change. Primus maintains a Hazardous Materials Business Plan overseen by the City of Hayward Fire Department. The Primus facility already includes fire-sprinkling, safety features, a scrubber, and other features required by environmental and health and safety regulations. The floor area occupied by Primus will not increase. The grant project does not involve a change in land use or any changes to, or expansion of, the exterior of the building. Therefore, this project is exempt under California Code of Regulations, title 14, section 15301, Existing Facilities.
 b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
 Initial Study Environmental Impact Report
 Negative Declaration Statement of Overriding Considerations
 Mitigated Negative Declaration

List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)

Legal Company Name:	Budget
UL LLC	\$ 0 (match \$96,900)
DNV GL USA, Inc.	\$ 0 (match \$225,000)
	\$

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

GRANT REQUEST FORM (GRF)

Legal Company Name:

Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
EPIC	17-18	301.001E	\$4,000,000
			\$
R&D Program Area: EDMFO: EDMF		TOTAL:	\$4,000,000
Explanation for "Other" selection			
Reimbursement Contract #:		Federal Agreement #:	

Recipient's Administrator/ Officer				Recipient's Project Manager			
Name:	Paul Kreiner			Name:	Paul Kreiner		
Address:	3967 Trust Way			Address:	3967 Trust Way		
City, State, Zip:	Hayward, CA 94545-3723			City, State, Zip:	Hayward, CA 94545-3723		
Phone:	650-814-2453 /	Fax:	- -	Phone:	650-814-2453 /	Fax:	- -
E-Mail:	paul.kreiner@primuspower.com			E-Mail:	paul.kreiner@primuspower.com		

Selection Process Used	
<input checked="" type="checkbox"/> Competitive Solicitation	Solicitation #: GFO-18-302
<input type="checkbox"/> First Come First Served Solicitation	

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
Primus Power Corporation**

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Initial Production Test and Design for Manufacturability
3	X	Design Certification and Pilot Production Test
4		LRIP Production Changes from Pilot Line Production
5		Finalized LRIP Manufacturing Design and Procedure
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities
8		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
BOM	Bill of Materials
BOP	Balance of Plant
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CM	Contract Manufacturer
CPR	Critical Project Review
DFM	Design for Manufacturability
DNV GL	Det Norske Veritas Germanischer Lloyd (global quality assurance and risk management company headquartered in Norway) [Legal name: DNV GL USA, Inc.]
EnergyPod 2	Primus Power EnergyPod® 2
EnergyPack	Series connected string of up to four EnergyPod 2s
EnergyFarm	Parallel array of multiple EnergyPacks
KPI	Key Performance Indicator
LRIP	Low Rate Initial Production
MRL	Manufacturing Readiness Level
MRP	Material Requirements Planning
Primus	Primus Power
QMS	Quality Management System
TAC	Technical Advisory Committee
TMS	Thermal Management System
UL	Underwriters Laboratories (global safety certification company headquartered in Illinois) [Legal name: UL LLC.]
VVWRA	Victor Valley Water Reclamation Authority

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 Primus Power Corporation

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the production scale-up of the Primus Power EnergyPod® 2 (EnergyPod 2) from MRL 7 (Manufacturing Readiness Level) to MRL 8. The EnergyPod 2 is a zinc bromide flow battery that the recipient asserts offers energy storage with an estimated five hours of continuous output at 25 kW, a useful life of 20 years, no electrode stack replacement, and a non-flammable electrolyte.

B. Problem/ Solution Statement

Problem

Grid energy storage needs significant advances in cost reduction in order to make renewable generation safe and reliable at high penetrations. The current manufacturing process for the Recipient's flow battery is only suitable for prototype quantities. To successfully execute its cost reduction roadmap, demonstrate the first wave of multi-MW deployments, and fulfill the significant demand for its revolutionary energy storage product, the Recipient needs to transition to a mature, higher volume manufacturing process.

Solution

The Recipient will transition to a mature, high volume manufacturing process using a contract manufacturing strategy that leverages existing high-volume manufacturing equipment and processes. Primus will receive the major subassemblies for the flow battery from contract manufacturing partners and complete the final assembly in its existing facility. Using this new process of outsourced manufacturing, the Recipient will be able to increase production while lowering costs, which will lead to the Recipient's ability to offer more cost-effective energy storage as well as turn a profit by 2020.

C. Goals and Objectives of the Agreement

Agreement Goals

- Improve the flow battery design for manufacturing in order to improve reliability and manufacturability at higher production rates and lower costs.
- Establish manufacturing partners and supply chains.
- Build and demonstrate Low-Rate Initial Production (LRIP) manufacturing process
- Produce up to 80 flow batteries at LRIP

Ratepayer Benefits:² This Agreement is intended to result in the ratepayer benefits of greater electricity reliability, lower costs and increased safety by making a 100% renewable energy generation a reality with low cost, long life, long duration energy storage systems. The Recipient asserts that Recipient's flow battery is the first no membrane, single flow loop, flow battery providing high voltage using low cost chemistry. According to the Recipient, this second-generation product improves upon the first-generation system by offering a higher power

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 Primus Power Corporation

capacity (25 kW) and 5-hour duration at a lower cost per unit of energy stored than any other storage technology on the market. The Recipient states that the flow battery has a lab-tested 20-year lifespan (30,000 cycles) without performance degradation. According to the Recipient, these features lead to a more reliable and less expensive energy storage product for utilities and commercial or industrial customers, enabling the smart grid and enhancing the capabilities of renewable energy generation assets. The Recipient asserts that while lithium ion (Li Ion) batteries that currently dominate the market pose fire hazards, the Recipient's flow battery uses a non-flammable electrolyte, which significantly increases safety of energy storage.

Technological Advancement and Breakthroughs:³ This Agreement is intended to lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by scaling up production of the Recipient's flow battery with rated power of 25kW and discharge energy of 125 kWh. Primus' technology offers a battery with no membrane, single flow loop and high voltage with low cost chemistry. The Recipient's flow battery differs from traditional flow batteries in that it does not require an ion exchange membrane, and it uses a single electrolyte flow loop. According to the Recipient, these differences provide significant competitive advantages because they require fewer parts and have longer system cycle life, higher power density, higher reliability and reduced safety risks. The Recipient's flow battery units may be interconnected with each other to form larger energy storage systems.

California's mandate to achieve 50% of total electricity production from renewable sources by 2030 will require significant innovation and investment in energy storage to provide reliable, continuous electricity. Current energy storage solutions that are not able to meet this challenge. According to the Recipient, while lithium ion (Li Ion) batteries currently dominate the market, they are best suited for small scale, short duration (e.g., less than 2 hours) and shallow discharge applications. The Recipient states that lithium ion batteries have limited life expectancy of between 3 and 6 years (2,000 to 5,000 cycles; fading 2 to 8% per year), pose fire hazards, require round-the-clock HVAC (Heating, Ventilation and Air Conditioning) in cold or hot climates, can only achieve one deep cycle per day and are expensive and difficult to recycle after their useful life because of their hazardous components.

Agreement Objectives

- Develop the Recipient's prototype flow battery design for manufacturing to a pilot production version followed by an LRIP production version.
- Develop the Recipient's initial production line to a pilot production line followed by an LRIP production line.
- Certify that the Recipient's design meets Underwriters Laboratories (UL) certification and test if the flow battery performs throughout the proper lifespan.
- Demonstrate Low Rate Initial Production (LRIP) of the Recipient's flow battery.
- Finalize design of the flow battery and manufacturing process.

³ California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

Exhibit A

Scope of Work

Primus Power Corporation

III. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products

The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V)**. Products that require a draft version are indicated by marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask. If “(draft and final)” does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, “**days**” means working days.

The Recipient shall:

For products that require a draft version, including the Final Report Outline and Final Report

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Consider incorporating all CAM comments into the final product. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product.
- Submit the revised product and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period, or approves a request for additional time.

For products that require a final version only

- Submit the product to the CAM for acceptance. The CAM may request minor revisions or explanations prior to acceptance.

For all products

- Submit all data and documents required as products in accordance with the following:

Instructions for Submitting Electronic Files and Developing Software:

○ **Electronic File Format**

- Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission’s software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick or CD-ROM.

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
 - Text documents will be in MS Word file format, version 2007 or later.
 - Documents intended for public distribution will be in PDF file format.
 - The Recipient must also provide the native Microsoft file format.
 - Project management documents will be in Microsoft Project file format, version 2007 or later.
- **Software Application Development**
- Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
 - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
 - Visual Studio.NET (version 2008 and up). Recommend 2010.
 - C# Programming Language with Presentation (UI), Business Object and Data Layers.
 - SQL (Structured Query Language).
 - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
 - Microsoft SQL Reporting Services. Recommend 2008 R2.
 - XML (external interfaces).

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

MEETINGS

Subtask 1.2 Kick-off Meeting

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

The Recipient shall:

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

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

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

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

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
 - An updated Project Schedule;
 - Technical products (subtask 1.1);
 - Progress reports and invoices (subtask 1.5);
 - Final Report (subtask 1.6);
 - Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - Any other relevant topics.
- Provide an *Updated Project Schedule, List of Match Funds, and List of Permits*, as needed to reflect any changes in the documents.

The CAM shall:

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

Recipient Products:

- Updated Project Schedule (*if applicable*)
- Updated List of Match Funds (*if applicable*)
- Updated List of Permits (*if applicable*)

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

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

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase.

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CPR meetings generally take place at the Energy Commission, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

The Recipient shall:

- Prepare a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

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

The Recipient shall:

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

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

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
 - Disposition of any state-owned equipment.
 - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
 - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
 - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
 - "Surviving" Agreement provisions such as repayment provisions and confidential products.
 - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary (*if applicable*)
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written Products

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

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

Products:

- Progress Reports
- Invoices

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Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use the Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM. (See *Task 1.1* for requirements for draft and final products.)

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:
 - Cover page (required)
 - Credits page on the reverse side of cover with legal disclaimer (required)
 - Acknowledgements page (optional)
 - Preface (required)
 - Abstract, keywords, and citation page (required)
 - Table of Contents (required, followed by List of Figures and List of Tables, if needed)
 - Executive summary (required)
 - Body of the report (required)
 - References (if applicable)
 - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
 - Bibliography (if applicable)
 - Appendices (if applicable) (Create a separate volume if very large.)
 - Attachments (if applicable)
 - Ensure that the document is written in the third person.
 - Ensure that the Executive Summary is understandable to the lay public.
 - Briefly summarize the completed work. Succinctly describe the project results and whether or not the project goals were accomplished.
 - Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.

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- If it's necessary to use a technical term in the Executive Summary, provide a brief definition or explanation when the technical term is first used.
- Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- Include a brief description of the project results in the Abstract.
- Submit a draft of the report to the CAM for review and comment. The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt
- Consider incorporating all CAM comments into the Final Report. If the Recipient disagrees with any comment, provide a written response explaining why the comment was not incorporated into the final product
- Submit the revised Final Report and responses to comments within 10 days of notice by the CAM, unless the CAM specifies a longer time period or approves a request for additional time.
- Submit one bound copy of the *Final Report* to the CAM along with *Written Responses to Comments on the Draft Final Report*.

Products:

- Final Report (draft and final)
- Written Responses to Comments on the Draft Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

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

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

The Recipient shall:

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

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

- A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.

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

Products:

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

Subtask 1.8 Permits

The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
 - The schedule the Recipient will follow in applying for and obtaining the permits.

The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.

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- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

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

Products:

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

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.

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- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

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

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

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- 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.

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- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues

The TAC shall:

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

Products:

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

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IV. TECHNICAL TASKS

Task 2: Initial Production Test and Design-for-Manufacturability

The goal of this task is produce an initial prototype manufacturing line utilizing the basic planned manufacturing process. Here the Recipient will produce up to 20 of the prototype flow batteries based on the basic manufacturing process which includes providing all the necessary information to suppliers while assessing in-house requirements. The initial prototypes will be evaluated and upgraded based on identified design-for-manufacturability (DFM) improvements.

Subtask 2.1 Basic Manufacturing Line for Initial Flow Battery Design

The goal of this subtask is to complete a basic manufacturing test of the initial prototype flow battery design in order to provide products for validation testing as well as to identify manufacturing process improvements, qualify and select new suppliers, and train new suppliers (including contract manufacturers(CMs)).

The Recipient shall:

- Validate and update all manufacturing and build instructions to support initial volumes, where needed.
- Validate that all existing inventory meets the current design requirements (per engineering drawings, specifications, etc.). Rework or scrap items that do not meet the design requirements, as required.
- Upgrade and add equipment to existing flow battery test bay locations at the manufacturing site.
- Procure additional flow battery fill and drain equipment to support factory acceptance and external validation testing.
- Review all other existing suppliers and ensure capabilities to support initial volumes. Qualify and select new suppliers, where needed.
- Develop ramp up plans with all suppliers, start documentation exchange, create first article and quality plans.
- Incorporate lessons learned from prior builds in Bill of Materials (BOMs) and manufacturing instructions.
- Train all new suppliers (including CMs) for flow battery manufacturing processes at the manufacturing facility and audit the end transfer process at the new supplier (including CM) facility.
- Test the basic manufacturing process by building up to 20 initial flow batteries.
- Test each battery produced for factory acceptance.
- Prepare a *Basic Manufacturing Results Report* that includes a high-level executive summary, which describes in detail the process and results of the basic manufacturing line, key preparatory tasks, production of units, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

Products:

- Basic Manufacturing Results Report

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Subtask 2.2: Qualify Design Improvement for Pilot Flow Battery Design

The goal of this subtask is to individually qualify flow battery design improvements prior to combined validation testing. This will ensure that the flow battery design can be updated with the complete package of pilot flow battery design improvements and validated with high confidence.

The Recipient shall:

- Upgrade the initially produced flow batteries from subtask 2.1 and subscale test platforms with design improvements.
- Test individual design improvements.
- Iterate design of pilot improvements as needed based on test results.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Procure updated initial flow battery design improvements.
- Re-test and qualify individual pilot design improvements.
- Prepare a *Qualification Test Report for Pilot Manufacturing* that includes a high-level executive summary, which describes in detail the process and results of the design improvements for the Pilot Manufacturing Line as a result of the manufacturing tests, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

Products:

- Qualification Test Report for Pilot Manufacturing

Subtask 2.3: Validate and Release Combined Pilot Design Improvements

The goal of this subtask is to validate the flow battery design with the complete set of pilot design improvements and formally release this design to manufacturing via the Recipient's product lifecycle management tool.

The Recipient shall:

- Upgrade two of the initially produced flow batteries with a complete set of pilot design improvements.
- Test upgraded flow batteries with pilot design improvements.
- Finalize parameters and software behaviors for flow batteries with pilot design improvements.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure

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the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Release flow battery design with pilot improvements.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Prepare an *Updated Qualification Test Report for Pilot Manufacturing* to include the process and results from upgrading two of the initially produced flow batteries with a complete set of pilot design improvements. This report should not disclose any confidential information.

Products:

- Updated Qualification Test Report for Pilot Manufacturing

Task 3: Design Certification and Pilot Production Test

The goal of this task is to have four of the initial flow batteries to be upgraded with the improvements for the pilot design and sent out to third parties to be tested for certification and reliability. The upgraded prototype will be tested as the near complete version for LRIP, which will be similar enough to the final LRIP version that the Underwriters Laboratory (UL) certification still applies to the regulations specified. The first pilot production test will occur after certification and reliability testing, and lessons learned have been incorporated.

Subtask 3.1: Complete UL Certification of Flow Battery

The goal of this subtask is to obtain UL certification for the flow battery to ensure that the design meets critical functional safety requirements necessary for large scale deployment before initiating LRIP. Critical feedback from the first half of this testing will be incorporated into the design improvements for LRIP demonstration.

The Recipient shall:

- Complete subcomponent tests identified by UL for certification to the following standards:
 - UL 991 (Standard for Tests for Safety-Related Controls Employing Solid-State Devices)
 - UL 1973 (Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications)
 - UL 1998 (Standard for Software in Programmable Components)
- Upgrade two flow batteries from the initial flow battery manufacturing line with validated design improvements for pilot testing.

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- Ship upgraded flow batteries to UL test facilities.
- Complete full scale flow battery tests identified by UL for certification to UL 991, UL 1973 and UL 1998.
- Prepare a *UL Certification Memo* that provides a high level executive summary of the UL certification results and any key takeaways that will affect future development. The *UL Certification Memo* will also include: (1) a list of the UL standards (with title and publication date, when applicable) used for testing as described above, and (2) a list of the tests (with title and publication date, when applicable) conducted that were identified by UL from the UL standards described above. This report should not disclose any confidential information.

Products:

- UL Certification Memo

Subtask 3.2: Complete Reliability and Lifetime Testing at Third Party Lab

The goal of this subtask is to complete third party reliability and lifetime testing of the flow battery to validate lifetime performance of the flow battery and ensure a sufficient level of reliability prior to launching pilot production. Critical feedback from this testing will be incorporated into design improvements for the pilot manufacturing test and LRIP manufacturing demonstration.

The Recipient shall:

- Upgrade two flow batteries from the initial flow battery manufacturing line with validated design improvements for pilot testing.
- Ship upgraded flow batteries to reliability test facilities.
- Complete 6-month reliability and lifetime testing.
- Prepare a *Reliability Test Memo* that provides a high level executive summary of the reliability test procedures, methodology, results and any key takeaways that will affect future development. This report should not disclose any confidential information.

Products:

- Reliability Test Memo

Subtask 3.3: Pilot Manufacturing Line Demonstration

The goal of this subtask is to complete the first pilot manufacturing test of the flow battery in order to identify further manufacturing process improvements and upgrade equipment and facilities in-house and at suppliers (including CMs) prior to initiating the LRIP.

The Recipient shall:

- Incorporate lessons learned from prior builds into manufacturing instructions.
- Launch Material Requirements Planning (MRP) and issue purchase orders to all suppliers.
- Order long-lead materials to satisfy build schedule.
- Order key manufacturing equipment to support pilot volumes including laser welding work cell, electrode sheet flatness inspection machine, and electrode assembly flatness inspection machine.
- Determine what additional supplier (including CM) facility upgrades for the stack assembly will be required for pilot demonstration, order necessary equipment and modify facilities.

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- Determine what supplier (including CM) facility upgrades will be required for welding capabilities for the Thermal Management System (TMS) and Balance of Plant (BOP); order necessary equipment and modify facilities.
- Determine what automation/robotic/sourcing improvements are achievable to ensure processes can achieve volume production requirements.
- Test pilot manufacturing line by building up to 40 pilot flow batteries.
- Test each battery produced for factory acceptance.
- Prepare a *Pilot Manufacturing Results Report* that includes a high-level executive summary, which describes in detail the process and results of the pilot manufacturing line, key preparatory tasks, production of units, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.
- Prepare *CPR Report #1* and participate in a CPR meeting immediately before the start of Task 4.
- Attend CPR meeting #1, which should take place after the *Pilot Manufacturing Results Report* is submitted.

Products:

- Pilot Manufacturing Results Report
- CPR Report #1

Task 4: LRIP Production Changes from Pilot Line Production

The goal of this task is to complete initial LRIP demonstration of the flow battery. This requires addressing any manufacturing issues found from the pilot line production, incorporating any improvements identified during initial reliability/lifetime and UL certification testing, and incorporating final cost reduction improvements necessary prior to LRIP.

Subtask 4.1: Upgrade Flow Batteries with Design Improvements for LRIP Demonstration

The goal of this subtask is to design and procure all critical design improvements required prior to LRIP demonstration and then upgrade existing internal flow batteries with these design improvements so that the improved design can be qualified and released prior to LRIP demonstration. These improvements include any remaining critical cost reductions, improvements identified during Pilot demonstration, and improvements identified during the first portion of third party reliability/lifetime and UL certification testing.

The Recipient shall:

- Design improvements as needed based on the pilot demonstration, and results of first portion of 3rd party reliability/lifetime and UL certification testing.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and

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potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Fabricate mold for injection molded cell frame.
- Run an initial test batch of injection molded cell frames.
- Upgrade pilot flow batteries with LRIP design improvements as needed.
- Prepare an *LRIP Design Improvements Report* that includes a high-level executive summary, which describes in detail the process and results of the design improvements for the LRIP Manufacturing Line as a result of the pilot manufacturing tests, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

Products:

- LRIP Design Improvements Report

Subtask 4.2: Individually Qualify Design Improvements for LRIP Battery Design

The goal of this subtask is to individually qualify design improvements on the LRIP battery design prior to combined validation testing. This will ensure that the flow battery can be updated with the complete package of design improvements and validated with high confidence.

The Recipient shall:

- Evaluate the initial test of cell frame samples and iterate mold / anneal parameters to complete further mold trials.
- Upgrade 3-Cell stack test platforms and test the flow battery with injection molded cell frame prototypes.
- Test injection molded cell frame prototypes.
- Upgrade in-house test flow batteries and subscale test platforms with other design improvements for LRIP.
- Test other individual design improvements for LRIP.
- Iterate design of LRIP improvements as needed based on test results.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Procure updated prototypes with design improvements for LRIP.
- Re-test and qualify individual design improvements.
- Prepare a *Qualification Test Report for LRIP Manufacturing* that includes a high-level executive summary, which describes in detail the process and results of the design improvements for the LRIP Manufacturing Line as a result of the pilot manufacturing tests, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

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Products:

- Qualification Test Report for LRIP Manufacturing

Subtask 4.3 Validate and Release Combined LRIP Design Improvements

The goal of this subtask is to validate the flow battery design with the complete set of LRIP design improvements and formally release this design to manufacturing (via the Recipient's product lifecycle management tool).

The Recipient shall:

- Upgrade two flow batteries with the complete set of LRIP design improvements.
- Test upgraded flow battery with design improvements for LRIP.
- Finalize parameters and software behaviors for the flow battery with LRIP design improvements.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Release flow battery design with LRIP improvements.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Prepare an *Updated Qualification Test Report for LRIP Manufacturing* to include the process and results from upgrading two of the initially produced flow batteries with a complete set of pilot design improvements. This report should not disclose any confidential information.

Products:

- Updated Qualification Test Report for LRIP Manufacturing

Subtask 4.4: Complete LRIP Manufacturing Demonstration

The goal of this subtask is to complete the LRIP build for flow battery manufacturing in order to demonstrate the production process.

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The Recipient shall:

- Transfer all production documentation to new suppliers (including CMs).
- Verify all production tooling and test equipment have been ordered and will be delivered in support of build schedules.
- Ensure quality plans are in place to monitor suppliers' (including CMs') production quality and control plans.
- Incorporate and update cost models.

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- Launch closed loop feedback process for continuous improvement.
- Demonstrate LRIP manufacturing line by building up to 80 LRIP flow batteries.
- Test each battery produced for factory acceptance.
- Prepare an *LRIP Manufacturing Results Report* that includes a high-level executive summary, which describes in detail the process and results of the LRIP manufacturing line, key preparatory tasks, production of units, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

Products:

- LRIP Manufacturing Results Report

Task 5: Finalized LRIP Manufacturing Design and Procedure

The LRIP manufacturing demonstration will be evaluated for critical learnings. The changes will be documented and two flow batteries from the LRIP manufacturing demonstration will be upgraded based on the critical learnings. After the upgrades the design will be finalized for future production. Final internal manufacturing protocol and supply chain details will be set.

Subtask 5.1: Incorporate critical learnings from LRIP demonstration

The goal of this task is to incorporate any critical learnings from the LRIP demonstration into the flow battery design prior to releasing the final design.

The Recipient shall:

- Update design documentation as needed to incorporate manufacturing feedback.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and

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potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Design improvements as required to address critical manufacturing issues identified during the LRIP demonstration.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Procure flow batteries with the improvements required to address critical manufacturing issues identified during the LRIP demonstration.
- Complete individual qualification testing of improvements required to address critical manufacturing issues identified during the LRIP demonstration.
- Upgrade 2 LRIP demonstration flow batteries with a complete set of improvements required to address critical manufacturing issues identified during the LRIP demonstration.
- Prepare a *Final Design Improvements Report* that includes a high-level executive summary, which describes in detail the process and results of the design improvements as a result of the LRIP manufacturing test, verification tasks, and identify any technical issues, and valuable lessons learned for this phase in the project. This report should not disclose any confidential information.

Products:

- Final Design Improvements Report

Subtask 5.2: Finalize Documentation of the Flow Battery Design and Manufacturing Line

The goal of this subtask is to finalize and formally release the flow battery design and finalize all instructions, plans and processes and qualify all suppliers (including CMs) to establish the manufacturing line.

The Recipient Shall:

- Finalize flow battery design documentation.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

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- Release demonstrated flow battery design in Arena.

This design is not considered data, a product, intellectual property, or anything else under this Agreement to which the Energy Commission has any rights (e.g., access, possession, a license, etc.). This design is included in this Scope of Work to ensure the Recipient conducts this work, but the Commission does not have any rights to the design in order to ensure that third-parties, such as competitors, cannot use this Agreement to gain access to it, such as through the Public Records Act, and potentially harm Recipient's ability to commercialize the technology described in this Agreement.

- Validate all work instructions, manufacturing processes, quality plans and control plans are in place and controlled to ensure MRL8 readiness.
- Validate all Key Performance Indicator (KPIs) that are established for all critical suppliers.
- Create Key Supplier monitoring requirements for in-process and outgoing quality and yield reporting.
- Audit all Key Suppliers training programs and validate that all operators are trained.
- Audit all suppliers' (including CMs') Quality Management Systems (QMSs) to ensure that they have processes in place to manage all incoming quality from their sub-suppliers and an overall robust QMS.
- Validate all outbound test plans have been completed and validated for all components shipping to the manufacturing facility.
- Prepare a *Summary and Checklist of Final Activities Report* that includes a high-level executive summary, which describes the final activities of this subtask, and includes a checklist of required items to be completed during this subtask. This report should not disclose any confidential information.

Products:

- Summary and Checklist of Final Activities Report (draft and final)

TASK 6: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
 - For Product Development Projects and Project Demonstrations:
 - Published documents, including date, title, and periodical name.
 - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
 - Greenhouse gas and criteria emissions reductions.

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- Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
- Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.
- Additional Information for Product Demonstrations:
 - Outcome of demonstrations and status of technology.
 - Number of similar installations.
 - Jobs created/retained as a result of the Agreement.
- For Information/Tools and Other Research Studies:
 - Outcome of project.
 - Published documents, including date, title, and periodical name.
 - A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - The number of website downloads.
 - An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
 - An estimate of energy and non-energy benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

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TASK 7: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
 - A description of the intended use(s) for and users of the project results.
 - Published documents, including date, title, and periodical name.
 - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
 - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
 - The number of website downloads or public requests for project results.
 - Additional areas as determined by the CAM.
- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the California Energy Commission.
- Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of 1300x500 pixels in landscape ratio) of pre- and post-technology installation at the project sites or related project photographs.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

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

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TASK 8: Production Readiness Plan

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

The Recipient shall:

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

Products:

- Production Readiness Plan (draft and final)

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.

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

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

Project Applicant: Primus Power Corporation

Project Title: Production Scale-Up of Low-Cost, Long-Life Flow Battery

Project Location – Specific: 3967 Trust Way

Project Location – City: Hayward 94545 **Project Location – County:** Alameda

Description of Nature, Purpose and Beneficiaries of Project:

Under grant Agreement EPC-18-012 with Primus Power Corporation (Primus), the California Energy Commission will provide a grant to fund the production scale-up of the Primus Power EnergyPod® 2 battery to demonstrate the manufacturability and cost-effectiveness of the battery. It is a zinc bromide flow battery that Primus asserts offers energy storage with an estimated five hours of continuous output at 25 kW, a useful life of 20 years, no electrode stack replacement, and a non-flammable electrolyte. The battery should benefit grid-level electricity storage providers looking for long-duration storage of renewable generated electricity.

The grant project activities will include design of, and scaling up of, Primus’ existing, initial production line to a pilot production line, followed by scale-up to Low Rate Initial Production. To scale-up, Primus will add equipment and chemicals to the existing production line at a light-industrial facility in Hayward, California. In addition, the design will be tested for conformance with Underwriters Laboratories (UL) standards.

Beneficiaries will include California’s investor-owned electric utilities and their customers (i.e., ratepayers), along with the public at large and the environment. The grant project is intended to result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety.

Name of Public Agency Approving Project: California Energy Commission

Name of Person or Agency Carrying Out Project: Primus Power Corporation

Exempt Status: *(check one)*

- Ministerial Exemption (Pub. Resources Code § 21080(b)(1); Cal. Code Regs., tit 14, § 15268);
- Declared Emergency (Pub. Resources Code § 21080(b)(3); Cal. Code Regs., tit 14, § 15269(a));
- Emergency Project (Pub. Resources Code § 21080(b)(4); Cal. Code Regs., tit 14, § 15269(b)(c));
- Categorical Exemption. State type and section number
Cal. Code Regs., tit. 14, § 15301
- Statutory Exemptions. State code number.
- Common Sense Exemption. (Cal. Code Regs., tit 14, §15061(b)(3))

Reasons why project is exempt:

To scale-up, Primus will add equipment and chemicals to its existing production line at a light-industrial facility in Hayward, California. Equipment to be added includes, for example, injection mold equipment, pick-and-place robotics, and a “clean room.” These additions are a minor alteration of existing private facilities and mechanical

Authority cited: Sections 21083 and 21110, Public Resources Code. Reference: Sections 21108, 21152, and 21152.1, Public Resources Code.

equipment. (Parts suppliers will also add equipment at their existing facilities.) The nature of the manufacturing and the types of chemicals used will not change. Primus maintains a Hazardous Materials Business Plan overseen by the City of Hayward Fire Department. The Primus facility already includes fire-sprinkling, safety features, a scrubber, and other features required by environmental and health and safety regulations. The floor area occupied by Primus will not increase. The grant project does not involve a change in land use or any changes to, or expansion of, the exterior of the building. Therefore, this project is exempt under California Code of Regulations, title 14, section 15301, Existing Facilities.

Lead Agency

Contact Person: Benson Gilbert **Area code/Telephone/Ext:** 916-445-5406

If filed by applicant:

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

Signature: _____ **Date:** _____ **Title:** _____

Signed by Responsible Agency

Signed by Lead Agency

Signed by Applicant

Date received for filing at OPR: _____

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: PRIMUS POWER CORPORATION

RESOLVED, that the State Energy Resources Conservation and Development Commission (Energy Commission) adopts the staff CEQA findings contained in the Agreement or Amendment Request Form (as applicable); and

RESOLVED, that the Energy Commission approves Agreement EPC-18-012 Primus Power Corporation for a \$4,000,000 grant to increase Primus' manufacturing capacity of the Primus Power EnergyPod 2, a zinc bromide flow battery that offers energy storage with an estimated five hours of continuous output at 25 kW, a useful life of 20 years, no electrode stack replacement, and a non-flammable electrolyte, and adopting staff's determination that this action is exempt from CEQA; and

FURTHER BE IT RESOLVED, that the Executive Director or his/her designee shall 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 June 12, 2019.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat