

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement EPC-17-017 (To be completed by CGL Office)

ERDD	Gina Barkalow	43	916-327-1446
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All Power Labs, Inc.	80-0845968
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The Nexus of Clean Energy, Healthy Forests, and a Stable Climate: Innovative Biomass Gasification for Sustainable Forest Management

	11/08/2017	12/31/2021	\$ 1,500,000
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ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date 10/11/2017 Consent Discussion

Business Meeting Presenter Gina Barkalow Time Needed: 5 minutes

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

Agenda Item Subject and Description

ALL POWER LABS, INC. Proposed resolution approving Agreement EPC-17-017 with All Power Labs, Inc. for a \$1,500,000 grant to develop an innovative and improved power system based on the technological platform of All Power Lab's mobile, containerized "Powertainer" biomass gasification system and to demonstrate increased power and biochar production capacity in a net metered pilot project using forest-based residual biomass at a mill site in Shasta County.

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 -- Cal. Code Regs., tit 14, § 15303

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

Explain reason why Agreement is exempt under the above section:

Section 15301 Existing Facilities provides an exemption for the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing structures, facilities, mechanical equipment or topographical features involving negligible or no expansion of use beyond that existing. This project will involve design and prototyping at an existing industrial manufacturing facility in Berkeley California and will constitute the operation and maintenance of existing tools and equipment at the facility. The project will involve negligible or no expansion of use beyond that currently existing.

In addition, part of the project will involve pilot deployment at an existing mill site in Anderson, California which is part of Shasta County. Shasta County has issued Notice of Exemption for a ministerial statutory exemption under section 15268. The Shasta County NOE also states that the project is also exempt under categorical exemption sections 15301, exemption for existing facilities and 15329, exemption for cogeneration projects at existing facilities. The pilot deployment will be conducted at an existing mill site which the County has determined qualifies as an existing facility under CEQA exemption 15301. Additionally CEQA exemption 15303, New Construction or Conversion of Small Structures, provides an exemption for the construction and location of limited numbers of new, small facilities or structures; installation of small new equipment; and the conversion of existing small structures from on use to another where only minor modifications are made in the exterior of the structure. This project will involve pilot deployment of a containerized skid-mounted integrated biomass gasifier which consists of locating one small new temporary structure along with the movable containerized gasifier at the exiting mill site. The system is housed in a standard 20 ft. shipping container. Deployment will also involve the installation of two small-diameter pipes to run water to the new small structure which is a minor alteration to the existing facility and does not have significant impact to the environment. Therefore this project meets the requirements for an exemption under section 15303.

Exhibit A Scope of Work

I. TASK ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		General Project Tasks
2		Project Preparation
3	X	Development, Prototyping, and Validation
4		Full System Build and Integration
5		Engineering Validation Testing
6		Pilot Deployment Site Preparation and Installation
7		Pilot Deployment Project Operation and Performance Testing
8		Evaluation of Project Benefits
9		Technology/Knowledge Transfer Activities
10		Production Readiness Plan

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CHP	Combined Heat and Power
CPR	Critical Project Review
kW	kilowatt
IOU	Investor Owned Utility
LCOE	Levelized Cost of Electricity
NEM	Net Energy Metering
PG&E	Pacific Gas and Electric Company
PT+	Powertainer+ technology
SB 1122 BioMAT	Senate Bill 1122 Bio Market Agreement Tariff
TAC	Technical Advisory Committee

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

A. Purpose of Agreement

The purpose of this Agreement is to fund research and development of the Powertainer+ (PT+), or other suitable name, a multi-modal power and products platform that will generate low-cost renewable energy, process thousands of tons of forestry waste derived from California's unprecedented tree die-off, and sequester massive amounts of carbon, accelerating deployment of distributed gasification technology throughout the state's forested communities. The PT+ will

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

be tested in a pilot project in Anderson, California.

B. Problem/ Solution Statement

Problem

California's forest health crisis is an emergency of unprecedented scope and scale, with disastrous implications for the state's environment, economy, energy systems, and human life. Unlike essentially all other technologies and solutions proposed to respond to the crisis, gasification has the potential to process forest waste in a way that extracts value and sequesters a large portion of its carbon. Before the recipient's development of the pre-commercial Powertainer technology, no one had developed gasification technology that could economically respond to the problem. As a result, there have not yet been any large-scale deployments of distributed, commercial-scale gasification technology. The acceleration of tree mortality and persistent drought conditions make finding solutions to this problem more critical with each passing day.

Solution

The Recipient will develop the PT+, a multi-modal power and products gasification platform that will generate renewable energy at lower cost than their previous gasification systems, process thousands of tons of forestry waste, and sequester massive amounts of carbon. This proposal will significantly decrease the technology platform's levelized cost of electricity (LCOE), radically increase its forestry waste processing capacity, add new value streams in the forms of hot water and biochar production, and significantly enhance the system's carbon sequestration capacity. The net result will be to make distributed forest biomass-to-energy projects even more economically viable, catalyzing large-scale commercial deployment to address California's forest health crisis. When fully matured and deployed at scale, the PT+ will enable a significant near-term and consistent scaling of sustainable forest management and fire remediation, while creating thousands of jobs throughout California. The PT+ remains mobile, but its capacity is designed to match the enormous scale of the tree mortality crisis, while accelerating deployment of distributed gasification technology in California's forested communities.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Reduce wildfire risk related to the tree mortality crisis;
- Provide a financial model for funding and scaling proactive forestry management and wildfire remediation;
- Produce renewable bioenergy to spur uptake of tariffs in support of Senate Bill 1122 Bio Market Agreement Tariff (BioMat) for renewable bioenergy projects, and to meet California's other statutory energy goals;
- Create clean energy jobs throughout the state;
- Reduce energy costs by generating cheap net-metered energy;
- Accelerate the deployment of distributed biomass gasification in California; and
- Mitigate climate change through the avoidance of conventional energy generation and the sequestration of fixed carbon from biomass waste.

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Ratepayer Benefits:² This Agreement will result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by creating a strong market demand for forestry biomass waste and generating cheap energy. This demand will increase safety by creating an economic driver to support forest thinning, thus reducing the risk of catastrophic wildfire and the associated damage to investor-owned utility (IOU) infrastructure, such as transmission lines and remote substations. Preventing this damage to or destruction of ratepayer-supported infrastructure lowers costs for ratepayers. Additionally, the ability of IOUs to use a higher-capacity Powertainer provides a much larger offset against the yearly billion-dollar vegetation management costs borne by IOUs (and hence by ratepayers). The PT+'s significant increase in waste processing capacity also significantly speeds up and improves the economics of wildfire risk reduction, magnifying the benefits listed above. The PT+ will directly increase PG&E's grid reliability by reducing peak loading by up to 250 kilowatt (kW), and has the potential to increase grid reliability significantly when deployed at scale. The technology will provide on-demand, non-weather dependent, renewable energy. The uniquely flexible nature of this energy will offer grid managers new tools to enhance grid stability and reliability. The technology can be used to provide local capacity in hard-to-serve areas, while reducing peak demand.

Technological Advancement and Breakthroughs:³ This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of California's statutory energy goals by substantially reducing the LCOE of distributed gasification, helping drive uptake of the undersubscribed BioMAT program and increasing the potential for mass commercial deployment of distributed biomass gasification technology, particularly through net energy metering. This breakthrough will help California achieve its goal of developing bioenergy markets (Bioenergy Action Plan 2012) and fulfil its ambitious renewable portfolio standard (SB X1-2, 2011-2012; SB350, 2015).

The PT+ will also help overcome barriers to achieving California's greenhouse gas (GHG) emissions reduction (AB 32, 2006) and air quality improvement goals. It reduces greenhouse gas and criteria pollutants over three primary pathways: 1) The PT+'s increased capacity and Combined Heat and Power (CHP) module expand the displacement of emissions from conventional generation; 2) the biochar offtake enables the sequestration of hundreds of tons carbon that would otherwise have been released into the atmosphere; and 3) its increased processing capacity avoids GHG and criteria emissions by reducing the risk of GHG emissions from wildfire and other forms of disposal, such as open pile burning or decomposition. The carbon sequestration potential of the biochar offtake is particularly groundbreaking because very few technologies exist that can essentially sequester atmospheric carbon, which is what the PT+ enables when paired with the natural forest ecosystem—an innovative and groundbreaking bio-energy technology, with carbon capture and storage. Additionally, as noted in the Governor's Clean Energy Jobs Plan (2011), clean energy jobs are a critical component of

² California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

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

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California's energy goals. When deployed at scale, the PT+ will result in the creation of thousands of jobs across multiple sectors, including manufacturing, feedstock supply chain (harvesting, processing, and transportation), equipment operation, construction, and project development.

Additional Co-benefits:

- Annual electricity and thermal savings;
- Expansion of forestry waste markets;
- Expansion/development of an agricultural biochar market;
- Peak load reduction;
- Flexible generation;
- Energy cost reductions;
- Reduced wildfire risk;
- Local air quality benefits;
- Water use reductions (through energy savings); and
- Watershed benefits.

Agreement Objectives

The objectives of this Agreement are to upgrade the Powertainer to the PT+ by:

- Increasing the power capacity of the Powertainer from 150kW to between 210-250kW, thereby making it the new PT+, while maintaining its mobility with a shipping container enclosure;
- Developing a pre-combustion biochar offtake, which will increase the Powertainer's capacity for forest waste processing from approximately 1100 to 2200 tons per year and boost biochar production (carbon sequestration capacity) from 56 to 235 tons per year as part of the new PT+;
- Developing a combined heat and power CHP module to increase energy conversion efficiency from its current 20 percent to the upgraded 60 percent and produce useful and salable thermal energy;
- Developing remote monitoring capabilities to reduce operational expenses and verify the new PT+'s performance improvements; and
- Carrying out a pilot net energy metering demonstration project that proves the ability of the PT+ to convert post-commercial forestry waste into significant revenue streams.

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.

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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:

o **Electronic File Format**

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

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

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format.
- The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

o **Software Application Development**

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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.

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

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

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

- o The CAM's expectations for accomplishing tasks described in the Scope of Work;
- o An updated Project Schedule;
- o Technical products (subtask 1.1);
- o Progress reports and invoices (subtask 1.5);

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- o Final Report (subtask 1.6);
 - o Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
 - o 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. 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.

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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.

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).

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- 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.
 - Include information on feedstock types (including categorization as primary and other) and quantity (wet/dry tons). Feedstocks information should be reported with the progress reports and, at the end of the year, should include the total annual amounts by feedstock types).
- 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

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

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end date. When creating the Final Report Outline and the Final Report, the Recipient must use the Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

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

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

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

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline, Style Manual, and Final Report Template provided by the CAM with the following considerations:
 - Ensure that the report includes the following items, in the following order:
 - Cover page
 - Credits page on the reverse side of cover with legal disclaimer (**required**)
 - Acknowledgements page (optional)
 - Preface
 - Abstract, keywords, and citation page (**required**)
 - Table of Contents (followed by List of Figures and List of Tables, if needed)
 - Executive summary
 - Body of the report
 - 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.

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- Identify which specific ratepayers can benefit from the project results and how they can achieve the benefits.
- 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.
- o Follow the Style Guide format requirements for headings, figures/tables, citations, and acronyms/abbreviations.
- o Ensure that the document omits subjective comments and opinions. However, recommendations in the conclusion of the report are allowed.
- o 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.

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

- o A list of the match funds that identifies:
 - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
 - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
 - A copy of 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:
 - o 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.
 - o 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

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

- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

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

Subtask 1.9 Subcontracts

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

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.
- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of 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

Exhibit A Scope of Work

on:

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

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

- Researchers knowledgeable about the project subject matter;
- 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.

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The Recipient shall:

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

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

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

TASK 2: PROJECT PREPARATION

The goal of this task is to secure the project site(s) and develop a detailed Measurement and Verification Plan.

Subtask 2.1: EXECUTE AN AGREEMENT WITH THE SELECTED PILOT DEPLOYMENT SITE

The goals of this task are to: (1) confirm the availability of the project pilot deployment site(s); and (2) execute any agreements necessary to secure the site(s).

The Recipient shall:

- Reach agreement with the selected pilot deployment site(s) regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, indemnity, the Recipient’s use of any removal or support staff, and any other necessary terms and conditions.
- For any changes to site location, Recipient must check with their CAM or CAO who will provide guidance regarding the level of Energy Commission approval required and must obtain advance written consent from Energy Commission staff before any site change.
- Prepare and provide a *Site Readiness Verification Document(s)* (e.g. Copy of Contract, Lease Agreement, Memorandum of Understanding, etc.).

Products:

- Site Readiness Verification Document(s)

Subtask 2.2: PROJECT MEASUREMENT AND VERIFICATION

The goal of this subtask is to develop a detailed Measurement and Verification Plan for the selected pilot deployment site(s). PT+ performance metrics, such as power output, CHP thermal output, and capacity factor will be assessed at the pilot deployment site, along with system reliability metrics, such as component failures and operator intervention. Feedstock metrics will also be measured and analyzed, including PT+ performance with different feedstock sizes and grades; feedstock consumption and waste processing rates; biochar production; and electrical, thermal, and total system efficiencies. Emissions monitoring for criteria pollutants will be undertaken to ensure conformance with California air quality standards and a GHG lifecycle analysis will be conducted. Finally, project costs will be aggregated with performance metrics to determine the capital and operating expenses and LCOE of the PT+. Fuel source will be “byproducts of sustainable forest management activities” as defined by the CPUC SB 1122 BioMAT program.⁴

⁴ See CPUC D14-12-081 - Decision Implementing Senate Bill 1122, Section 2.2.3 Bioenergy Using Byproducts of Sustainable Forest Management and Appendix B SB 1122 Forest Biomass – Forest Biomass Sustainability Byproduct Eligibility Form: Instructions and Worksheet.
<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K960/143960061.pdf>

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The Recipient shall:

- Develop a detailed *Measurement and Verification Plan* for each site to include but not be limited to:
 - A description of the monitoring equipment and instrumentation which will be used at each site.
 - A description of the key input parameters and output metrics which will be measured (including, but not limited to those described above): PT+ performance metrics, such as power output, CHP thermal output, and capacity factor will be assessed at the site, along with system reliability metrics, such as component failures and operator intervention. Feedstock metrics will also be measured and analyzed, including PT+ performance with different feedstock sizes and grades; feedstock consumption and waste processing rates; biochar production; and electrical, thermal, and total system efficiencies. Emissions monitoring for criteria pollutants will be undertaken to ensure conformance with California air quality standards and a GHG lifecycle analysis will be conducted).
 - A description of the analysis methods to be employed.

Products:

- Measurement and Verification Plan (draft and final)

TASK 3: DEVELOPMENT, PROTOTYPING, AND VALIDATION

The goals of this task are to design, prototype and validate the pre-combustion biochar offtake, CHP module, emissions control, and remote monitoring subsystems. These subsystems are new additions to the Powertainer platform that, along with the unit's increased capacity, make it the PT+. Fuel source will be "byproducts of sustainable forest management activities" as defined by the CPUC SB 1122 BioMAT program.⁵

Subtask 3.1: DESIGN, PROTOTYPING, AND VALIDATION OF PRE-COMBUSTION BIOCHAR OFFTAKE SUBSYSTEM

The goal of this subtask is to design, prototype, and validate the pre-combustion biochar offtake subsystem.

The Recipient shall:

- Design the integration, prototyping and validation testing of the pre-combustion biochar offtake subsystem;
- Generate *Biochar Offtake Design Drawings Report* for pre-combustion biochar offtake subsystem that include, but are not limited to:
 - Design of biochar offtake integration with pyrocoil;
 - Design drawings of biochar offtake airlock; and
 - Design drawings of biochar storage assembly.

⁵ See CPUC D14-12-081 - Decision Implementing Senate Bill 1122, Section 2.2.3 Bioenergy Using Byproducts of Sustainable Forest Management and Appendix B SB 1122 Forest Biomass – Forest Biomass Sustainability Byproduct Eligibility Form: Instructions and Worksheet.
<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K960/143960061.pdf>

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- Prepare a *Biochar Offtake Engineering Validation Test Plan* for the biochar offtake subsystem that includes, but is not limited to:
 - Goals and methods for testing biochar output;
 - Goals and methods for testing biochar throughput rates;
 - Goals and methods for testing biochar characteristics.
- Build the prototype biochar offtake subsystem; and
- Test the biochar offtake subsystem and prepare an *Biochar Offtake Engineering Validation Test Results Report* that includes, but is not limited to:
 - Results from testing biochar output;
 - Results from testing biochar throughput rates;
 - Results from testing biochar characteristics; and
 - Issues, concerns and mitigation plans.

Products:

- Biochar Offtake Design Drawings Report (draft and final)
- Biochar Offtake Engineering Validation Test Plan (draft and final)
- Biochar Offtake Engineering Validation Test Results Report (draft and final)
- Photographs of the pre-combustion biochar offtake system during build process and after build completion.

Subtask 3.2: DESIGN, PROTOTYPING, AND VALIDATION OF CHP MODULE

The goal of this subtask is to design, prototype, and validate the CHP module.

The Recipient shall:

- Design the integration, prototyping and validation testing of the CHP module;
- Design the engine coolant loop CHP module.
- Design the engine exhaust CHP module.
- Prepare and provide a *CHP Module Design Drawings Report* that describes, but is not limited to:
 - Designs for engine coolant loop CHP module;
 - Designs for the engine exhaust loop CHP module; and
 - Designs for integration of the CHP modules with the PT+ system
- Prepare an *CHP Module Engineering Validation Test Plan* for the CHP module that describes, but is not limited to:
 - Goals and methods of testing the safety of CHP modules;
 - Goals and methods of testing the efficiency of CHP modules; and
 - Goals and methods of testing total system efficiency.
- Build the CHP module prototype; and
- Test the CHP module and prepare *CHP Module Engineering Validation Test Results Report*, which includes, but is not limited to:
 - Results of testing the safety of CHP modules;
 - Results of testing the efficiency of CHP modules;
 - Results of testing total system efficiency; and
 - Issues, concerns and mitigation plans.

Products:

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- CHP Module Design Drawings Report (draft and final)
- CHP Module Engineering Validation Test Plan (draft and final)
- CHP Module Engineering Validation Test Results Report (draft and final)
- Photographs of the CHP module during build process and after build completion.

Subtask 3.3: DESIGNS, PROTOTYPING, AND VALIDATION OF PT+

The goal of this subtask is to design, prototype, and validate the PT+.

The Recipient shall:

- Design the integration, prototyping and validation testing of the PT+;
- Generate *PT+ Design Drawings Report* for the PT+ that describe, but are not limited to:
 - Designs for gasifier architecture;
 - Designs for plumbing and ducting;
 - Designs for genset.
- Prepare a *PT+ Engineering Validation Test Plan* for the PT+ that describes, but is not limited to:
 - Goals and methods for testing gasifier reactor;
 - Goals and methods for testing genset;
 - Goals and methods for testing full system capacity; and
 - Goals and methods for testing operation of system at various loads.
- Build the PT+ prototype; and
- Test the PT+ and prepare *PT+ Engineering Validation Test Results* which includes, but is not limited to:
 - Results of testing gasifier reactor;
 - Results of testing genset;
 - Results of testing full system capacity;
 - Results of testing operation of system at various loads; and
 - Issues, concerns and mitigation plans.

Products:

- PT+ Design Drawings Report
- PT+ Engineering Validation Test Plan (draft and final)
- PT+ Engineering Validation Test Results (draft and final)
- Photographs of the PT+ during build process and after build completion.

Subtask 3.4: DESIGN, PROTOTYPING, AND VALIDATION OF EMISSIONS CONTROL SUBSYSTEM

The goal of this subtask is to design, prototype, and validate the emissions control subsystem. Depending on the higher-capacity PT+'s potential emissions profile changes, other emissions control technologies, including selective catalytic reduction (SCR), may be required to continue to meet aggressive state criteria pollutant targets. To meet target power outputs, a turbo system or higher displacement engine may need to be integrated or replace the current genset. The engineering team must determine whether it can directly scale up the small-scale CHP system, or if it will require a different approach. Automating systems on the PT+ to reduce the need for operator oversight and presence will require the development of robust control algorithms and logic.

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The Recipient shall:

- Design the integration, prototyping and validation testing of the emissions control subsystem;
- Generate *Emissions Subsystem Design Drawings Report* for the emissions control subsystem that describes, but is not limited to:
 - Downselection of emissions control catalysts or system for exhaust; and
 - Integration of selected emissions control system with PT+.
- Prepare an *Emissions Subsystem Engineering Validation Test Plan* for the emissions control subsystem that describes, but is not limited to:
 - Goals and methods of testing emissions control system on criteria pollutants; and
 - Goals and methods of tuning genset with emissions control system.
- Build the prototype emissions control subsystem; and
- Test the emissions system and prepare *Emissions Subsystem Engineering Validation Test Results Report* that describes, but is not limited to:
 - Results of testing emissions control subsystem on criteria pollutants;
 - Results of tuning genset with emissions control subsystem; and
 - Issues, concerns and mitigation plans.
-

Products:

- Emissions Control Subsystem Design Drawings Report (draft and final)
- Emissions Control Subsystem Engineering Validation Test Plan (draft and final)
- Emissions Control Subsystem Engineering Validation Test Results Report (draft and final)
- Photographs of the emissions control subsystem during build process and after build completion.

Subtask 3.5: DESIGN, PROTOTYPING, AND VALIDATION OF REMOTE MONITORING SUBSYSTEM

The goal of this subtask is to design, prototype, and validate the remote monitoring subsystem.

The Recipient shall:

- Design the integration, prototyping and validation testing of the remote monitoring subsystem: and
- Generate *Remote Monitoring Design Drawings Report* that describes, but is not limited to:
 - The physical control system for remote monitoring;
 - The software/firmware control system for remote monitoring;
 - Integration of the above control systems with the PT+ automation assembly.
- Prepare a *Remote Monitoring Engineering Validation Test Plan* for the remote monitoring subsystem that describes, but is not limited to:
 - Goals and methods of testing the remote monitoring equipment onsite;
 - Goals and methods of testing the remote monitoring subsystem offsite;
 - Goals and methods of testing the remote monitoring subsystem for extended operation.
- Build the prototype remote monitoring subsystem;

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- Test the remote monitoring system and prepare *Remote Monitoring Engineering Validation Test Results Report* that includes, but is not limited to:
 - Results of testing the remote monitoring equipment onsite;
 - Results of testing the remote monitoring subsystem offsite;
 - Results of testing the remote monitoring subsystem for extended operation.
 - Issues, concerns and mitigation plans.
- Prepare a *CPR Report* and participate in a CPR meeting, per subtask 3.1. (To be conducted before beginning work on Task 4)

Products:

- Remote Monitoring Design Drawings Report
- Remote Monitoring Engineering Validation Test Plan (draft and final)
- Remote Monitoring Engineering Validation Test Results Report (draft and final)
- CPR Report
- Photographs of the remote monitoring subsystem during build process and after build completion.

TASK 4: FULL PT+ SYSTEM BUILD AND INTEGRATION

The goals of this task are to plan, manufacture, and integrate the full PT+ system.

Subtask 4.1 Manufacturing & Supply Chain Planning

The goal of this subtask is to plan the PT+ supply chain and manufacturing.

The Recipient shall:

- Finalize the PT+ Bill of Materials and generate a *PT+ Bill of Materials Report* that describes the itemized materials.
- Create a *PT+ Manufacturing & Supply Chain Plan* for all components, assemblies, and subsystems, which includes, but is not limited to:
 - Suppliers
 - Purchases
 - Manufacturing Orders
 - Issues, concerns and mitigation plans

Products:

- PT+ Bill of Materials Report (draft and final)
- PT+ Manufacturing & Supply Chain Plan (draft and final)

Subtask 4.2: DESIGN REVIEW WITH MANUFACTURER

The goal of this subtask is to review the PT+ design with the manufacturer and plan for the manufacturer to manufacture the enclosure and fuel feed subsystems.

The Recipient shall:

- Conduct review of manufacturing design of enclosure and fuel feed subsystems with manufacturer; and
- Prepare *Manufacturer Design Review Report* which includes, but is not limited to:
 - Enclosure and fuel feed subsystem detailed review notes
 - Change and improvement recommendations

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- Implement design revisions via issuance of Engineering Change Orders;
- Prepare *Manufacturer Engineering Change Order Report* that describes, but is not limited to:
 - Contents of Engineering Change Orders;
 - Actions taken to respond to Engineering Change Orders.

Products:

- Manufacturer Design Review Report (draft and final)
- Manufacturer Engineering Change Order Report (draft and final)

Subtask 4.3: BUILD SUBSYSTEMS IN HOUSE AT RECIPIENT'S FACILITY

The goal of this subtask is to build all subsystems, except for the enclosure and fuel feed subsystems, at the Recipient's facility. These subsystems include the emissions control, pre-combustion biochar offtake, and CHP module subsystems, as well as the genset, automation assembly, gasifier, flare, and filter subsystems.

The Recipient shall:

- Issue manufacturing orders to build all subsystems beside the enclosure and fuel feed subsystems at Recipient facility.
- Manufacture emissions control, pre-combustion biochar offtake, CHP module, genset, automation assembly, gasifier, flare, and filter subsystems.
- Prepare an *In-House Manufacturing Report* that describes, but is not limited to:
 - List and description of component assembly;
 - Date of build for each assembly;
 - Assembly personnel;
 - Photographs of assembly process as well as after assembly completion.
 - Issues found and resolutions.

Products:

- In-House Manufacturing Report (draft and final)

Subtask 4.4: MANUFACTURING, INTEGRATION, AND PACKAGING OF ENCLOSURE AND FUEL FEED SUBSYSTEMS AT MANUFACTURER'S FACILITY

The goal of this subtask is for the Recipient to ensure that the manufacturer builds the enclosure and feedstock processing subsystems and packages them for transport to Recipient's facility; and for Recipient to integrate the subsystems that it builds at Recipient's facility (see Subtask 4.3) with the enclosure and feedstock processing subsystems from the manufacturer.

The Recipient shall:

- With prior CAM written approval, issue *Purchase Order* to contract with the manufacturer for manufacturing, integration and packaging of the enclosure and fuel feed subsystems;
- Manufacture, integrate, and package enclosure and fuel feed subsystems; and
- Prepare an *Manufacturer Build, Integration, and Packaging Report* which includes, but is not limited to:
 - Purchase Orders;
 - Documentation of manufacturing, integration, and packaging;
 - Build schedule status;
 - Issues found and resolution;

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Products:

- Purchase Order (draft and final)
- Manufacturer Build, Integration, and Packaging Report (draft and final)

Subtask 4.5: TRANSPORTATION AND DELIVERY OF ENCLOSURE AND FUEL FEED SUBSYSTEMS TO RECIPIENT'S FACILITY AND INTEGRATION OF SUBSYSTEMS

The goal of this subtask is to transport and deliver the enclosure and fuel feed systems to Recipient's facility and integrate them with the subsystems manufactured at Recipient's facility.

The Recipient shall:

- Arrange for transportation and delivery of the enclosure and fuel feed subsystems from the manufacturer's facility to Recipient's facility.
- Integrate all subsystems.
- Prepare a *Transportation and Delivery Report* that describes, but is not limited to:
 - Status of PT+ delivery;
 - Photographs of delivered system at Recipient's facility; and
 - Any issues found and resolved.
- Prepare an *PT+ System Integration Report* which includes, but is not limited to:
 - Purchase Orders;
 - Documentation of manufacturing, integration, and packaging;
 - Build schedule status;
 - Issues found and resolution;

Products:

- Transportation and Delivery Report (draft and final)
- PT+ System Integration Report (draft and final)

TASK 5: ENGINEERING VALIDATION TESTING

The goals of this task are to conduct design validation testing of the fully built PT+. Fuel source will be "byproducts of sustainable forest management activities" as defined by the CPUC SB 1122 BioMAT program.⁶

Subtask 5.1: INITIAL PT+ COMMISSIONING

The goal of this subtask is to commission the PT+.

The Recipient shall:

- Develop and execute *Initial Commissioning Test Plans* for PT+ that include, but are not limited to:
 - Cold testing of mechanical assemblies;
 - These assemblies include, but are not limited to, the feed system, valves, and ash removal system;

⁶ See CPUC D14-12-081 - Decision Implementing Senate Bill 1122, Section 2.2.3 Bioenergy Using Byproducts of Sustainable Forest Management and Appendix B SB 1122 Forest Biomass – Forest Biomass Sustainability Byproduct Eligibility Form: Instructions and Worksheet.
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- Cold testing of automation subsystem;
- Warm testing of gasifier subsystem;
- Warm testing of genset;
- Hot testing of full PT+.
- Prepare *Initial Commissioning Report* which includes, but is not limited to:
 - Performance of each aspect of Initial Commissioning Test Plans;
 - Issues found and resolutions.

Products:

- Initial Commissioning Test Plans (draft and final)
- Initial Commissioning Report (draft and final)

Subtask 5.2: PT+ TUNING

The goal of this task is to tune the PT+ settings to ensure proper and optimized performance.

The Recipient shall:

- Develop and execute *PT + Tuning Plan*, which includes, but is not limited to:
 - Tuning settings for the gasifier subsystem;
 - Tuning settings for the genset subsystem;
 - Tuning settings for the emissions control subsystem; and
 - Tuning settings for the full integrated PT+.
- Make necessary adjustments and improvements to both firmware and hardware systems to optimize performance;
- Generate *PT+ Tuning Report* which includes, but is not limited to, the following:
 - Results of tuning of the gasifier subsystem;
 - Results of tuning of the genset subsystem;
 - Results of tuning of the emissions control subsystem;
 - Results of tuning of the full integrated system;
 - Description of firmware updates;
 - Description of hardware improvements; and
 - Issues, concerns and mitigation plans.

Products:

- PT+ Tuning Plan (draft and final)
- PT+ Tuning Report (draft and final)

Subtask 5.3: FULL INTEGRATED PT+ SYSTEM TESTING

The goal of this subtask is to test the fully integrated PT+.

The Recipient shall:

- Prepare a *Full Integrated PT+ System Test Plan* that includes, but is not limited to:
 - Preparatory steps for full system testing;
 - A safety plan for full system testing;
 - Goals and methods of power generation testing;
 - Goals and methods of heat generation testing;
 - Goals and methods of emissions testing; and

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- Conduct full system testing
- Prepare *Full Integrated PT+ System Test Report* which includes, but is not limited to, the following:
 - Results of Power Generation Testing;
 - Results of Heat Generation Testing;
 - Results of Emissions Testing; and
 - Issues, concerns and mitigation plans

Products:

- Full Integrated PT+ System Test Plan (draft and final)
- Full Integrated PT+ System Test Report (draft and final)

TASK 6: PILOT DEPLOYMENT SITE PREPARATION AND INSTALLATION

The goals of this task are to prepare the pilot deployment site for installation and install the PT+ at the pilot deployment site. Fuel source will be “byproducts of sustainable forest management activities” as defined by the CPUC SB 1122 BioMAT program.⁷

Subtask 6.1: FEEDSTOCK SUPPLY CHAIN DEVELOPMENT

The goal of this task is to develop the feedstock supply chain.

The Recipient shall:

- Prepare *Feedstock Qualification Plan* that includes, but is not limited to:
 - Goals and methods of feedstock qualification;
 - Goals and methods of site logistics qualification related to feedstock; and
 - Steps required to prepare site for feedstock handling.
- Qualify the feedstock and logistics at the pilot deployment site and confirm that they meet specifications;
- Prepare and provide a *Feedstock Supply Chain Report* that includes, but is not limited to:
 - Results of feedstock qualification
 - Results of site logistics qualification; and
 - Issues, concerns and mitigation plans.

Products:

- Feedstock Qualification Plan (draft and final)
- Feedstock Supply Chain Report (draft and final)

Subtask 6.2: INTERCONNECT AND NET ENERGY METERING PERMITTING

The goal of this subtask is to ensure that the pilot deployment site's obtains a net energy metering (NEM) permit and to set up interconnection facilities. Please note that in accordance with Task 1.8 herein, permit costs and the expenses associated with obtaining permits are not

⁷ See CPUC D14-12-081 - Decision Implementing Senate Bill 1122, Section 2.2.3 Bioenergy Using Byproducts of Sustainable Forest Management and Appendix B SB 1122 Forest Biomass – Forest Biomass Sustainability Byproduct Eligibility Form: Instructions and Worksheet.
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reimbursable under this Agreement.

The Recipient shall:

- Oversee the pilot deployment site host's application for a NEM Permit;
- Prepare a *NEM Permit Status Report* once the NEM permit has been secured that includes, but is not limited to:
 - A copy of the NEM permit
 - A mitigation plan for any issues that may arise.
- Prepare an *Interconnection Installation Plan* that includes, but is not limited to:
 - Goals and methods for installation of interconnection equipment;
 - Interconnection schematic;
 - Contracting of licensed electrical engineer for inspection and sign off; and
 - Final interconnection approval and hookup.
- Carry out *Interconnection Installation Plan*
- Prepare *Interconnection Installation Report* that includes, but is not limited to:
 - Results of interconnection equipment installation;
 - Final interconnection schematic;
 - Copy of the electrical engineer interconnection report;
 - Copy of utility certification of proper interconnection approval and hookup; and
 - Issues, concerns and mitigation plans.

Products:

- NEM Permit Status Report
- Interconnection Installation Plan (draft and final)
- Interconnection Installation Report (draft and final)

Subtask 6.3: PILOT DEPLOYMENT SITE PREPARATION

The goals of this subtask are to prepare the electrical, mechanical, and physical infrastructure of the pilot deployment site for PT+ operation.

The Recipient shall:

- Prepare a *Pilot Deployment Site Preparation Plan* that includes, but is not limited to:
 - Team kickoff meeting
 - Electrical energy integration plan and design schematics;
 - Thermal energy integration plan and design schematics;
 - PT+ pad preparation plan;
 - Schedule of activities
- Carry out preparation activities for the site as described in *Pilot Deployment Site Preparation Plan*; and
- Prepare *Pilot Deployment Site Preparation Report* that includes, but is not limited to:
 - Team kickoff meeting minutes;
 - Photographs and written documentation of electrical and thermal energy integration;
 - Photographs and written documentation of PT+ pad preparation;
 - Electrical engineer sign-off for electrical system;
 - Mechanical engineer sign-off for thermal system;
 - Issues, concerns and mitigation plans.

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Products:

- Pilot Deployment Site Preparation Plan (draft and final)
- Pilot Deployment Site Preparation Report (draft and final)

Subtask 6.4: TRANSPORTATION AND INSTALLATION OF PT+ TO THE PILOT DEPLOYMENT PROJECT SITE

The goals of this task are to transport the PT+ to the project pilot deployment site and install it.

The Recipient shall:

- Prepare *Transportation and Installation Plan* that includes, but is not limited to:
 - Plan for mode of transportation of PT+;
 - Contract with commercial or private hauler for transportation of PT+;
 - Plan for unloading and installing PT+ at pilot deployment site.
- Transport the PT+ from the Recipient's facility to the project pilot deployment site and install it in accordance with Transportation and Installation Plan;
- Prepare *Site Delivery Report* which includes but is not limited to:
 - The date that delivery was completed;
 - Results of transportation and installation;
 - Description of obstacles encountered and resolutions; and
 - Photographs of PT+ installation including photographs taken during and after installation.

Products:

- Transportation and Installation Plan (draft and final)
- Site Delivery Report (draft and final)

TASK 7: PILOT PROJECT OPERATION AND PERFORMANCE TESTING

The goals of this task are commission the PT+ at the pilot deployment site in stand-alone and interconnected mode, conduct performance and reliability testing, and develop the biochar supply chain. Fuel source will be "byproducts of sustainable forest management activities" as defined by the CPUC SB 1122 BioMAT program.⁸

Subtask 7.1: COMMISSIONING OF PT+

The goal of this task is to commission the PT+.

The Recipient shall:

- Prepare *PT+ Commissioning Plan* which includes, but is not limited to, the following:
 - Goals and methods of assessing commissioning of Power and Heat Generation Performance in both standalone and interconnected modes;
 - Goals and methods of assessing Biochar production commissioning, in both

⁸ See CPUC D14-12-081 - Decision Implementing Senate Bill 1122, Section 2.2.3 Bioenergy Using Byproducts of Sustainable Forest Management and Appendix B SB 1122 Forest Biomass – Forest Biomass Sustainability Byproduct Eligibility Form: Instructions and Worksheet.
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- standalone and interconnected modes;
- Goals and methods of assessing biochar supply chain integration with onsite biochar company
- Execute *PT+ Commissioning Plan*; and
- Prepare *PT+ Commissioning Report*, which includes, but is not limited to:
 - Assessment of commissioning of Power and Heat Generation Performance in both standalone and interconnected modes;
 - Assessment of Biochar production commissioning, in both standalone and interconnected modes;
 - Assessment of biochar supply chain integration with onsite biochar company;
 - Photographs of commissioning process;
 - Issues, concerns and mitigation plans.

Products:

- PT+ Commissioning Plan (draft and final)
- PT+ Commissioning Report (draft and final)

Subtask 7.2: EXTENDED PT+ OPERATION AND PERFORMANCE TESTING

The goals of this subtask are to operate the PT+ for an extended run time and collect performance test data.

The Recipient shall:

- Prepare an *Extended Operation and Testing Plan* that includes, but is not limited to:
 - Plan for operation and maintenance between the Recipient and pilot testing site personnel;
 - Plan for biochar output assessment;
 - Plan for extended operation of biochar supply chain;
 - Plan for extended operation feedstock supply chain;
- Execute *Extended Operation and Testing Plan*;
- Execute *Measurement and Verification Plan*;
- Prepare *Extended Operation and Testing Report* that includes, but is not limited to, the following:
 - Assessment of operation and maintenance issues;
 - Assessment of extended operation of biochar supply chain;
 - Assessment of biochar produced;
 - Assessment of extended operation of biochar supply chain;
 - Any changes in testing that needed to be different than what the plan called for due to practical considerations;
 - Preliminary testing report; and
 - Third-party independent assessment and analysis of data collected from the PT+ during execution of the *Measurement and Verification Plan*.
- Use an independent, third-party measurement and verification service, which will be employed to conduct an independent assessment and analysis of data collected from the PT+ and prepare a *Measurement and Verification Report*. With CAM approval, the *Executive Summary* or detailed attachments from the *Measurement and Verification Report* may be included in the *Extended Operation and Testing Report*.

Exhibit A Scope of Work

Products:

- Extended Operation and Testing Plan (draft and final)
- Extended Operation and Testing Report (draft and final)
- Measurement and Verification Report (draft and final)

TASK 8: EVALUATION OF PROJECT BENEFITS

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

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*. Update *Attachment 12 Cost and Benefit Calculations and Small-Scale Bioenergy LCOE calculator*. If not using LCOE calculator, clearly explain why not applicable, provide other cost measures and justify the measures.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:
 - For Product Development Projects and Project Demonstrations:
 - Published documents, including date, title, and periodical name.
 - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
 - Greenhouse gas and criteria emissions reductions.
 - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
 - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
 - A discussion of project product downloads from websites, and publications in technical journals.
 - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
 - Additional Information for Product Development Projects:
 - Outcome of product development efforts, such copyrights and license agreements.
 - Units sold or projected to be sold in California and outside of California.
 - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - Investment dollars/follow-on private funding as a result of Energy Commission funding.
 - Patent numbers and applications, along with dates and brief descriptions.

Exhibit A Scope of Work

- 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 has 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, Attachment 12 Cost and Benefits Calculations, LCOE calculator or other, as applicable.
- Mid-term Benefits Questionnaire, Attachment 12 Cost and Benefits Calculations, LCOE calculator or other, as applicable.
- Final Meeting Benefits Questionnaire, Attachment 12 Cost and Benefits Calculations, LCOE calculator or other, as applicable.

TASK 9: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

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

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
 - An explanation of how the knowledge gained from the project will be made

Exhibit A Scope of Work

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)

TASK 10: PRODUCTION READINESS PLAN

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

The Recipient shall:

- Prepare a *Production Readiness Plan*. The degree of detail in the plan should be proportional to the complexity of producing or commercializing the proposed product, and to its state of development. As appropriate, the plan will discuss the following:
 - Critical production processes, equipment, facilities, personnel resources, and support systems needed to produce a commercially viable product.
 - Internal manufacturing facilities, supplier technologies, capacity constraints imposed by the design under consideration, design-critical elements, and the use of hazardous or non-recyclable materials. The product manufacturing effort may include "proof of production processes."

Exhibit A Scope of Work

- 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.

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION - RE: ALL POWER LABS, INC.

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-17-017 from GFO-15-325 with All Power Labs, Inc. for a \$1,500,000 grant to develop an innovative and improved power system based on the technological platform of All Power Lab's mobile, containerized "Powertainer" biomass gasification system and to demonstrate increased power and biochar production capacity in a net metered pilot project using forest-based residual biomass at a mill site in Shasta County; 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 October 11, 2017.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat