

GRANT REQUEST FORM (GRF)

CEC-270 (Revised 10/2015)

CALIFORNIA ENERGY COMMISSION

New Agreement FRD-17-005 (To be completed by CGL Office)

ERDD	Pilar Magana	43	916-327-2216
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West Biofuels LLC	20-5974773
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Agricultural and Woody Biomass to Jet Fuel Intermediate Research and Development
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4/1/2018	12/1/2021	\$ 3,000,000
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☐ ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	2/21/2018	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
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Business Meeting Presenter	Pilar Magana	Time Needed:	5 minutes
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Please select one list serve. Transportation (General Trans / Petroleum Issues)

Agenda Item Subject and Description

WEST BIOFUELS, LLC. Proposed resolution approving Agreement FRD-17-005 with West Biofuels, LLC for a \$3,000,000 grant to conduct research on and demonstrate an advanced thermochemical fast pyrolysis system that will convert biomass to a bio-oil intermediate fuel to produce a minimum of 50,000 gallons of bio-oil that can be upgraded and refined to low-carbon jet fuel.

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, 15302, 15306☐ Common Sense Exemption. 14 CCR 15061 (b) (3)

Explain reason why Agreement is exempt under the above section:

This project will modify an existing gasification system to operate as a catalytic fast pyrolysis reactor in order to demonstrate a process of converting biomass to a bio-oil intermediate. This project will also involve data collection and data analysis to measure the results of the conversion process. The existing system is housed indoors at a research facility in Woodland, California and all modifications to the system will take place indoors at the same site. There will be no construction of new structures or equipment and there will be no modifications to the research facility as a result of the project. The project falls within existing permits for use of the facility and for air quality. This project is therefore categorically exempt under CEQA Guidelines section 15301 as operation or minor alteration of an existing facility involving negligible or no expansion of an existing use, categorically exempt under CEQA Guidelines section 15302 as a replacement or reconstruction of an existing structure located at the same site as the structure replaced and with substantially the same purpose as the structure replaced, and categorically exempt under CEQA Guidelines section 15306 as basic data collection, research, and resource evaluation activities that do not result in a serious or major disturbance to an environmental resource.

☐ b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)

Check all that apply

☐ Initial Study☐ Negative Declaration☐ Mitigated Negative Declaration☐ Environmental Impact Report☐ Statement of Overriding Considerations

[illegible]

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CALIFORNIA ENERGY COMMISSION

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

Legal Company Name:

Budget Information

Funding Source		Funding Year of Appropriation	Budget List No.	Amount
GENERAL		16-17	310.001	\$3,000,000
				\$
				\$
				\$
				\$
				\$
R&D Program Area:	EGRO: Transportation		TOTAL:	\$3,000,000
Explanation for "Other" selection				
Reimbursement Contract #:			Federal Agreement #:	

Recipient's Administrator/ Officer

Name:	Kristen Decker	Name:	Matthew Summers
Address:	765 Baywood Dr Ste 340	Address:	14958 County Road 100B
City, State, Zip:	Petaluma, CA 94954-5507	City, State, Zip:	Woodland, CA 95776-9104
Phone:	415-446-2751 /	Fax:	- -
E-Mail:	Kristen.decker@headlands.us		

Recipient's Project Manager**Selection Process Used**

- ☒ Competitive Solicitation
 Solicitation #: GFO-17-901
☐ 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
West Biofuels, LLC.

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR ¹	Task Name
1		Project Administration
2		Contract Execution
3	X	Reaction System Design and Reconfiguration
4	X	Production of Bio-oil
5		Co-Processing Studies
6	X	Hydrotreating Studies
7		Technoeconomic Analysis and Life Cycle Assessment
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
CFP	Catalytic Fast Pyrolysis
CO ₂ e	Carbon Dioxide Equivalent
CPR	Critical Project Review
FCC	Fluid Catalytic Cracker
M&V	Measurement and Verification
MJ	Megajoule
Recipient	West Biofuels, LLC
TAC	Technical Advisory Committee
TPD	Ton Per Day
VGO	Vacuum Gas Oil

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

A. Purpose of Agreement

The purpose of this Agreement is to fund the demonstration of a fast pyrolysis system that will convert biomass to a bio-oil intermediate fuel that can be upgraded and refined to jet fuel.

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

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B. Problem/ Solution Statement

Problem

In California, petroleum-based fuels contribute to the largest source of carbon emissions. Fungible low-carbon fuels produced from California's biomass feedstock provide an opportunity to reduce carbon emissions and California's dependency on petroleum fuels. Today's technology does not support commercial production without research that focuses on scaling up advanced production processes.

Solution

West Biofuels, LLC (Recipient) owns and operates a dual bed gasification system that has been deployed at commercial scale in five locations in Europe. West Biofuels has demonstrated successful performance of this system with California biomass. West Biofuels seeks to modify operational parameters along with some gas conditioning systems to optimize the production of bio-oils. Specifically, West Biofuels has an operating 5 ton per day (TPD) dual-bed gasifier that will be modified to operate as an in-situ catalytic fast pyrolysis (CFP) reactor with catalyst circulating between the reactor and the regenerator. By successfully demonstrating the modification of a commercially-viable gasification system, West Biofuels can validate a scalable approach to bio-oil production. The pre-commercial demonstration will contain the following three major process steps:

- Catalytic fast pyrolysis of biomass to make an upgraded bio-oil with intermediate oxygen content
- Co-processing of CFP oil in a conventional fluid catalytic cracker (FCC) with petroleum-derived vacuum gas oil (VGO) to produce jet and diesel fuel precursors with significant biogenic carbon content
- Upgrading of FCC diesel fractions to jet fuel by hydrotreating combined with hydrodeoxygenation/hydroisomerization to produce jet fuel blendstocks.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to:

- Goal 1: Demonstrate production of jet fuel blendstock precursor from biomass feedstock
- Goal 2: Facilitate the introduction of renewable carbon into the fuels infrastructure
- Goal 3: Reduce the carbon footprint of a refinery and fuels it produces

Agreement Objectives

The objectives of this Agreement are to:

- Objective 1: Mass conversion efficiency of at least 30% bio-oil with forest wood feedstock

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- Objective 2: Mass conversion efficiency of at least 30% bio-oil with almond shell feedstock
- Objective 3: Yield of co-processing distillate products equivalent to yields obtained when processing fossil feedstock only
- Objective 4: Hydrotreating of co-processing distillates to at least 50% material boiling in the jet fuel range
- Objective 5: A carbon intensity less than 20 gCO₂e/MJ
- Objective 6: Demonstrate a process that will produce an intermediate bio-oil for less than \$3.00 per gasoline-gallon equivalent at a commercial scale

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III. TASK 1 PROJECT ADMINISTRATION

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

- 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.
- Submit the final product to the CAM once agreement has been reached on the draft. The CAM will provide written approval of the final product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- If the CAM determines that the final product does not sufficiently incorporate his/her comments, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For products that require a final version only

- Submit the product to the CAM for approval.
- If the CAM determines that the product requires revision, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

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- **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.

- **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.

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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:

- 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*.

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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.

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.

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- 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 research 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 all Agreement activities conducted by the Recipient for the preceding month, including 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.
 - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the terms and conditions. In addition, each invoice must document and verify:
 - Energy Commission funds received by California-based entities;
 - Energy Commission funds spent in California (*if applicable*); and
 - Match fund 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 and approve 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 a 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.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

Recipient Products:

- Final Report Outline (draft and final)

CAM Product:

- Style Manual

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Products:

- Final Report (draft and final)

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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.
 - 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.

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- 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 reimbursable under this Agreement. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

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

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

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

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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 research direction. The guidance may include research scope and methodologies, timing, and coordination with other research. 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 research (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.

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- Evaluate the tangible benefits of project research 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 research 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

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Subtask 1.11 TAC Meetings

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

The Recipient shall:

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

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 Contract Execution

The goals of this task are to: (1) confirm the availability of the project demonstration site and a measurement and verification (M&V) contractor; and (2) execute any agreements necessary to secure the demonstration site and M&V contractor.

Subtask 2.1 Execute a Contract with the Selected Demonstration Site

The Recipient shall:

- Reach agreement with the manager(s) of the selected demonstration site regarding the project timeline, space reserved for the project, equipment installation, permit and insurance requirements, indemnity, and the Recipient’s use of any removal or support staff.
- If the selected demonstration site becomes unavailable during the project term, work with the CAM to select a new site.
- Execute a *Contract with the Demonstration Site* that confirms the agreement reached above on the Recipient’s use of the site.

Products:

- Contract with the Demonstration Site

Subtask 2.2 Execute a Contract with the Selected M&V Contractor

The Recipient shall:

- Confirm the selected M&V contractor’s ability to provide required hardware, software, and staff to conduct the required measurements during the project term.
- Confirm that the selected M&V contractor will follow utility M&V protocols, and will prepare a detailed analytical report that verifies energy consumption and engineering calculations for energy and cost savings.
- If the selected M&V contractor becomes unavailable during the project term, the Recipient shall work with the CAM to select a new M&V contractor.

EXHIBIT A
SCOPE OF WORK
West Biofuels, LLC.

- Execute a *Contract with the M&V Contractor* that secures the contractor's services during the project term and confirms that the contractor will follow M&V protocol and prepare the detailed analytical report.

Products:

- Contract with the M&V Contractor

TASK 3 Reaction System Design and Reconfiguration

The goal of this task is to re-design and reconfigure the dual-bed gasification system as a recirculating pyrolysis reaction system.

The Recipient shall:

- Prepare a *Design and Reconfiguration Plan* that will outline the design basis for reconfiguration of the dual bed reactor. The Design and Reconfiguration Plan will include, but is not limited to:
 - Identification of desired operating conditions
 - Evaluation of major subsystems, including, but not limited to:
 - Pyrolysis Reactor
 - Regenerator
 - Bio-oil Condenser
 - Scrubbing System
 - Identification of necessary modifications
 - Detailed engineering calculations to specify and execute design changes
- Implement the changes identified in the Design and Reconfiguration Plan
- Prepare a *Design and Reconfiguration Report* detailing the results of the reconfiguration and confirming readiness for operations.
- Prepare a *Critical Project Review Report*
- Attend a Critical Project Review Meeting (per Task 1.3)

Products:

- Design and Reconfiguration Plan
- Design and Reconfiguration Report
- Critical Project Review Report

TASK 4 Production of Bio-oil

The goal of this task is to produce bio-oil intermediates with California feedstock.

The Recipient shall:

- Prepare modified system to operate as an *in-situ* CFP reactor with catalyst circulating between the reactor and the regenerator.

EXHIBIT A
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West Biofuels, LLC.

- Determine a set of sustainable biomass sources, utilizing California's organic waste streams, which would reliably provide a biomass for its conversion to an intermediate fuel product.
- Prepare a *Production Schedule* identifying a timeline for bio-oil production and associated conditions. The Production Schedule will include, but is not limited to:
 - Identification of catalyst used (if any)
 - Identification of feedstock
 - Identification of operating parameters
 - Duration of production run
 - Target feedstock consumption
 - Target bio-oil production
- Implement the Production Schedule
- Produce at least 50,000 gallons of intermediate bio-oil over the project term
- Prepare a *Production Report* detailing the results from the operations associated with the Production Schedule and that also includes, but is not limited to, the following:
 - Chemical and physical characterization of bio-oil to ensure that it meets requirements for upgrading in existing refineries (including biorefineries).
 - Determination of the most cost-intensive parts of the developed projects and projections of how these costs will change based on a transition from pilot-scale project to a commercial scale project (> 500,000 gallons of intermediate fuel per year). Suggest solutions on how to minimize the costs.
- Prepare a *Critical Project Review Report*
- Attend a Critical Project Review Meeting (per Task 1.3)

Products:

- Production Schedule
- Production Report (draft and final)
- Critical Project Review Report

TASK 5 Co-Processing Studies

The goal of this task is to investigate the impact of process conditions and bio-oil quality on the fluid catalytic cracking of blends of bio-oil and vacuum gas oil, and to generate samples for hydrotreating to jet fuel blendstocks.

The Recipient shall:

- Prepare a *Co-Processing Study Plan* that will detail the process and equipment used to extensively characterize the physical and chemical properties of the jet fuel blendstock. The *Co-Processing Study Plan* will include, but is not limited to:
 - Description of equipment to be used
 - Identification of operating parameters including, but not limited to:
 - Reaction time

EXHIBIT A
SCOPE OF WORK
West Biofuels, LLC.

- Temperature
- Identification of co-processing blend levels (e.g. 5%, 10%, 20%)
- Target co-processing results
- Test methodologies for evaluating co-processing productions, including but not limited to:
 - ASTM D-2887 (Simulated chromatographic distillation)
 - TAN (both strong and weak acids)
 - Elemental analysis
 - Proximate analysis
 - ICP on ash
 - Coking tendency (e.g. Conradson carbon)
 - PIANO
 - Transport Properties (density, viscosity, pour point)
 - Detailed hydrocarbon and oxygenate specification and quantification (2D GCxGC/TOFMS, LCMS, GCFID)
 - Water (Karl-Fischer)
 - ¹³C- and ³¹P-NMR
 - ¹³C/¹²C (for biogenic carbon tracking)
 - Limited characterization of modern carbon by ¹⁴C analysis.
- Identification of success metrics
- Implement Co-Processing Study Plan.
- Prepare a *Co-Processing Study Report* that will document the results of the co-processing study.

Products:

- Co-Processing Study Plan
- Co-Processing Study Report (draft and final)

TASK 6 Hydrotreating Studies

The goal of this task is to upgrade via catalytic hydrotreating of distillate products from the co-processing studies in order to investigate the technical and economic feasibility of production of jet fuel blendstocks by hydroprocessing.

The Recipient shall:

- Prepare a *Hydrotreating Studies Plan* that will detail the plans for hydroprocessing the co-processed bio-oil and vacuum gas oil blendstock. The *Hydrotreating Studies Plan* will include, but is not limited to:
 - Description of equipment to be used
 - Identification of catalysts used
 - Identification of operating conditions
 - Target hydroprocessing results
 - Test methodologies for evaluating hydroprocessing products, including but not limited to:
 - ASTM D-2887 (simulated chromatographic distillation)
 - TAN (both strong and weak acids)

EXHIBIT A
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- Elemental analysis
 - Proximate analysis
 - Coking tendency (e.g. Conradson carbon)
 - Freeze point
 - PIANO
 - Transport properties (e.g. density, viscosity, pour point)
 - Detailed hydrocarbon and oxygenate speciation and quantification (2D GCxGC/TOFMS, LCMS, GCFID)
 - Water (Karl-Fischer)
 - ^{13}C - and ^{31}P -NMR
 - $^{13}\text{C}/^{12}\text{C}$ (for biogenic carbon tracking)
 - Limited characterization of modern carbon by ^{14}C analysis.
- Implement Hydrotreating Studies Plan
 - Prepare *Hydrotreating Studies Report* detailing the results of the implementation of the Hydrotreating Studies Plan.
 - Prepare a *Critical Project Review Report* to document intermediate results.
 - Attend a Critical Project Review Meeting (per Task 1.3)

Products:

- Hydrotreating Studies Plan (draft and final)
- Hydrotreating Studies Report (draft and final)
- Critical Project Review Report

TASK 7 Technoeconomic Analysis and Life Cycle Assessment

The goal of this task is to conduct technoeconomic analysis on the process system to identify key cost drivers that will impact the economics of production of bio-jet fuel by the process pathway being investigated.

The Recipient shall:

- Prepare a *Technoeconomic Analysis Report* that will identify key cost drivers impacting the technical and economic performance of production of bio-jet fuel according to the processes detailed in prior tasks. The *Technoeconomic Analysis Report* will include, but is not limited to:
 - Full material and energy balance models (e.g. Aspen Plus)
 - Pro forma models for financial viability
 - Justifications of all assumptions
 - Evaluation of results compared to relevant existing publicly available literature
- Prepare a *Life Cycle Assessment Report* that evaluates the greenhouse gas impacts of the jet fuel pathway. The *Life Cycle Assessment Report* will include, but is not limited to:
 - Description of life cycle analysis methods
 - Identification of key environmental and sustainability metrics
 - Calculation of the carbon intensity of the fuel pathway

EXHIBIT A
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- Evaluation of the impacts of the life cycle assessment results on the economic feasibility of the pathway

Products:

- Technoeconomic Analysis Report
- Life Cycle Assessment Report

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*.
- 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:
 - i. Published documents, including date, title, and periodical name.
 - ii. Estimated or actual fuel savings, and estimated statewide fuel savings once market potential has been realized. Identify all assumptions used in the estimates.
 - iii. Greenhouse gas and criteria emissions reductions.
 - iv. Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
 - v. Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
 - vi. A discussion of research product downloads from websites, and publications in technical journals.
 - vii. 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.
 - viii. Additional Information for Product Development Projects:
 - 1. Outcome of product development efforts, such copyrights and license agreements.
 - 2. Units sold or projected to be sold in California and outside of California.
 - 3. Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
 - 4. Investment dollars/follow-on private funding as a result of Energy Commission funding.

EXHIBIT A
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West Biofuels, LLC.

5. Patent numbers and applications, along with dates and brief descriptions.
- ix. Additional Information for Product Demonstrations:
 1. Outcome of demonstrations and status of technology.
 2. Number of similar installations.
 3. Jobs created/retained as a result of the Agreement.
- o For Information/Tools and Other Research Studies:
 - i. Outcome of research.
 - ii. Published documents, including date, title, and periodical name.
 - iii. A discussion of policy development. State if the research has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
 - iv. The number of website downloads.
 - v. An estimate of how the information and research have affected energy use and cost, or have resulted in other non-energy benefits.
 - vi. An estimate of energy and non-energy benefits.
 - vii. Data on potential job creation, market potential, economic development, and increased state revenue as a result of research.
 - viii. A discussion of research product downloads from websites, and publications in technical journals.
 - ix. 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

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 research. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses research results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:

EXHIBIT A
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West Biofuels, LLC.

- 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, 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 research 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 research 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.
- 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)
- 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."
 - The estimated cost of production.
 - The expected investment threshold needed to launch the commercial product.
 - An implementation plan to ramp up to full production.

EXHIBIT A
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- 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: WEST BIOFUELS, LLC

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 FRD-17-005 with West Biofuels, LLC for a \$3,000,000 grant to conduct research on and demonstrate an advanced thermochemical fast pyrolysis system that will convert biomass to a bio-oil intermediate fuel to produce a minimum of 50,000 gallons of bio-oil that can be upgraded and refined to low-carbon jet fuel; 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 February 21, 2018.

AYE: [List of Commissioners]

NAY: [List of Commissioners]

ABSENT: [List of Commissioners]

ABSTAIN: [List of Commissioners]

Cody Goldthrite,
Secretariat