California Energy Commission
October 08, 2025 Business Meeting
Backup Materials for Spatial Informatics Group LLC

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution
2. Grant Request Form
3. Scope of Work

[PROPOSED]

RESOLUTION NO: 25-1008-XX

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Spatial Informatics Group LLC

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

RESOLVED, that the CEC approves agreement EPC-25-025 with Spatial Informatics Group LLC for a $1,000,000 grant. This project will support the continued development and enhancement of PyreCast, an open-source software platform that provides near-term wildfire forecasting and situational awareness, to advance forecasting capabilities and decision-support tools for California's electricity sector; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC 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 CEC held on October 08, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kim Todd
Secretariat

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

CEC-270 (Revised 01/2024)

GRANT REQUEST FORM (GRF)

A. New Agreement Number

IMPORTANT: New Agreement # to be completed by Contracts, Grants, and Loans Office.

New Agreement Number: EPC-25-025

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Jill Horing
3. MS-:51
4. Phone Number: 279-226-1037

C. Recipient's Information

1. Recipient's Legal Name: Spatial Informatics Group LLC
2. Federal ID Number: 94-3316211

D. Title of Project

Title of project: Science Integration and Enhancement of PyreCast: An Open-source Near-Term Wildfire Modeling and Forecasting Platform

E. Term and Amount

1. Start Date: 10/30/2025
2. End Date: 3/30/2029
3. Amount: $1,000,000.00

F. Business Meeting Information

1. Are the ARFVTP agreements $75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 10/8/2025 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Aryana Sherzai
5. Time Needed for Business Meeting: 10 minutes.
6. The email subscription topic is: Electric Program Investment Charge (EPIC)

Agenda Item Subject and Description:

Proposed resolution approving agreement EPC-25-025 with Spatial Informatics Group LLC for a $1,000,000 grant, and adopting staff's recommendation that this action is exempt from the California Environmental Quality Act (CEQA). This agreement will support the continued development and enhancement of PyreCast, an open-source software platform that provides near-term wildfire forecasting and situational awareness, to advance forecasting capabilities and decision-support tools for California's electricity sector.

G. California Environmental Quality Act (CEQA) Compliance

1. **Is Agreement considered a "Project" under CEQA?**
   Yes

   If yes, skip to question 2.

   If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a "Project":

Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because:

2. **If Agreement is considered a "Project" under CEQA answer the following questions.**

a) Agreement **IS** exempt?

Yes

Statutory Exemption?
No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

PRC section number: None

CCR section number: None

Categorical Exemption?
Yes

If yes, list CCR section number(s) and separate each with a comma. If no, enter "None" and go to the next question.

CCR section number: Cal. Code Regs., tit. 14, § 15306 ;

Common Sense Exemption? 14 CCR 15061 (b) (3)
No

If yes, explain reason why Agreement is exempt under the above section. If no, enter "Not applicable" and go to the next section.

Cal. Code Regs., tit. 14, Section 15301, Existing Facilities, provides that projects which consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, and which involve negligible, or no expansion of use are exempt from CEQA. The proposed project will be performed entirely within existing offices and/or research facilities that conduct computer modeling and data research. The proposed project will not expand the use of existing facilities or have any alterations of existing public or private structures, facilities, or topographical features. Therefore, the project falls within section 15301 and will not have a significant effect on the environment.

Cal. Code Regs., tit. 14, Section 15306, Information Collection, exempts from CEQA projects that consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. The proposed project activities fall within these categories. The potential changes to the environment in preventing or minimizing wildfire, which might stem from the project, are not part of the grant activities, and the CEC is not approving any of those hypothetical future actions at this time. For these reasons, the proposed project will have no significant effect on the environment and is categorically exempt under section 15306.

This project does not involve impacts on any particularly sensitive environment; any cumulative impacts of successive projects of the same type in the same place that might be considered significant; does not involve unusual circumstances that might have a significant effect on the environment; will not result in damage to scenic resources within a highway officially designated as a state scenic highway; the project sites are not included on any list compiled pursuant to Government Code section 65962.5, and the project will not cause a substantial adverse change in the significance of a historical resource. Therefore, none of the exceptions to categorical exemptions listed in CEQA Guidelines section 15300.2 apply to this project, and this project will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.

IMPORTANT: consult with the legal office to determine next steps.

No

If yes, answer yes or no to all that applies. If no, list all as "no" and "None" as "yes".

Additional Documents	Applies
Initial Study	No
Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. Is this project considered "Infrastructure"?

No

I. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter "No subcontractors to report" and "0" to funds. **Delete** any unused rows from the table.

Subcontractor Legal Company Name	CEC Funds	Match Funds
Lumen Energy Strategy, LLC	$89,595	$9,000
Planet Labs Corporation	$99,500	$0
The Regents of the University of California on behalf of the Irvine Campus	$70,000	$0
University of San Francisco	$80,000	$0
Sonoma Technology, Inc.	$99,500	$0
Cloudfire Inc.	$35,000	$40,000

J. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter “No vendors or sellers to report” and “0” to funds. **Delete** any unused rows from the table.

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
Clere, Inc.	**$**15,000	**$**0
KBoxers LLC	$0	$20,000
Hurricane Electric LLC	$0	$102,000

K. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter “No key partners to report.” **Delete** any unused rows from the table.

Key Partner Legal Company Name
No key partners to report

L. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter “N/A” for “Not Applicable” and “0” to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	24-25	301.001L	$ 1,000,000

TOTAL Amount: $ 1,000,000

R&D Program Area: ESB: EA

Explanation for “Other” selection Not applicable

Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

M. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: David Saah

Address: 2529 Yolanda Ct

City, State, Zip: Pleasanton, CA 94566-7513

Phone: 510-427 -3571

E-Mail: dsaah@sig-gis.com

2. Recipient’s Project Manager

Name: Shane Romsos

Address: 2529 Yolanda Ct

City, State, Zip: Pleasanton, CA 94566-7513

Phone: 530-721-7508

E-Mail: sromsos@sig-gis.com

N. Selection Process Used

There are three types of selection process. List the one used for this GRF.

Selection Process	Additional Information
Competitive Solicitation #	GFO-24-306
First Come First Served Solicitation #	Not applicable
Other	Not applicable

O. Attached Items

1. List all items that should be attached to this GRF by entering “Yes” or “No”.

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	No
5	Awardee CEQA Documentation	Yes

Approved By

Individuals who approve this form must enter their full name and approval date in the MS Word version.

Agreement Manager: Jill Horing

Approval Date: 08/26/2025

Branch Manager: Alex Horangic

Approval Date: 08/28/2025

Director: Alex Horangic for Jonah Steinbuck

Approval Date: 08/28/2025

Exhibit A
Scope of Work
Spatial Informatics Group, LLC

I. TASK AND ACRONYM/TERM LISTS

A. Task List

Task #	CPR[1]	Task Name
1		General Project Tasks
2		Stakeholder Engagement
3		PyreCast Revisions in Response to Stakeholder Engagement
4	X	Integration of Dynamic Coupled Weather-Wildfire Behavior Model and Pyretechnics into PyreCast
5		Integration of High-resolution Fuels Model Data and Near-real Time Surface and Canopy Fuel Moisture Measurement into PyreCast
6	X	Performance Benchmarking of Active Fire Forecasts
7		Evaluation of Project Benefits
8		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
ADA	The Americans with Disabilities Act
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CAWFE™	Coupled Atmosphere-Wildland Fire Environment
CEC	California Energy Commission
CPR	Critical Project Review
FSPro	Fire Spread Probability. A US Forest Service probabilistic two-dimensional model that predicts how a fire will spread over time.
PSPS	Power Safety Power Shutoff
SIG	Spatial Informatics Group
TAC	Technical Advisory Committee
Wireframe	Visual guide that outlines the structure and layout of a software application or website, focusing on functionality and architecture.

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

A. Purpose of Agreement

The purpose of this agreement is to support the continued development and enhancement of PyreCast, an open-source software platform that provides near-term wildfire forecasting and situational awareness, to advance forecasting capabilities and decision-support tools for

[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.

California's electricity sector. Building upon the project team's prior EPIC-funded work under EPC-18-026, and in close collaboration with energy sector stakeholders, the team will refine PyreCast's user interface, extend forecast horizons, and enhance the accuracy of model outputs and usability of risk visualizations.

B. Problem/ Solution Statement

Problem

California faces escalating risks from climate-driven wildfires.[2] Wildfires disrupt grid infrastructure leading to power outages, force de-energization events to avoid ignitions, and pose significant cost to utilities in both mitigation and liability.[3] As extreme fire weather days increase,[4,5] utilities must make high-stakes decisions about Public Safety Power Shutoffs (PSPS), infrastructure hardening, and emergency response. However, existing wildfire forecasting tools lack real-time uncertainty quantification, making it difficult for grid operators to assess the reliability of fire spread predictions and proactively mitigate risk. Current models, such as Fire Spread Probability (FSPro) and other deterministic fire spread simulators, rely on historical climate trends and static assumptions,[6] failing to capture real-time weather variability and fire-induced wind dynamics. Additionally, these tools are not fully open source, and thus less accessible and cost effective to run. Research from the previously funded Spatial Informatics Group (SIG) Pyregence Project (EPC-18-026) highlights the need for an accessible, easy to use, real-time fire forecasting system that integrates weather, wildfire risk, fuels, active fire spread and grid infrastructure data. As climate change accelerates fire unpredictability, decision-makers urgently need data-driven, open-access solutions that provide confidence-rated wildfire forecasts.

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[2] Moore Foundation. *The Economic, Fiscal, and Environmental Costs of Wildfires in California*. Blue Sky Consulting Group, 2023. https://www.moore.org/docs/default-source/initiative/wildfire-resilience-initiative/moore-foundation_wildfire-resilience-initiative_cost-of-ca-wildfires-vs-solutions-report-2023.pdf

[3] Omega Environmental. *A Detailed Guide to Understanding California Wildfire Damage*. 2024. https://www.omegaenv.com/environmental-consulting-firm-blog/a-detailed-guide-to-understanding-california-wildfire-damage/. Accessed 31 Mar. 2025.

[4] Stanford University. "Increasing Risk of Extreme Wildfire Weather." *Stanford News*, 2020. https://news.stanford.edu/stories/2020/04/increasing-risk-extreme-wildfire-weather. Accessed 5 Apr. 2025.

[5] California Governor's Office of Planning and Research. "Summary of Projected Climate Change Impacts on California." *California Climate Adaptation Strategy*, https://climateresilience.ca.gov/overview/impacts.html. Accessed 5 Apr. 2025.

[6] 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).

moisture data, seasonal forecasting capabilities, near-real time wildfire behavior model performance benchmarking and integration of a dynamic coupled weather-wildfire behavior model such as CAWFE™. These enhancements directly address the growing threat of wildfire to California's electric grid and communities, especially in high-risk, underserved regions.

By improving the accuracy and speed of forecasts, PyreCast supports users' ability to make smarter, faster decisions, including more precise and targeted infrastructure protection and optimized fire response. These actions can reduce unnecessary outages, lower infrastructure repair costs, and improve safety and reliability for ratepayers. The project delivers technological breakthroughs that support California's statutory energy goals. It advances open science, provides an alternative to inaccessible proprietary models, and ensures equitable access to critical wildfire risk decision support tools. As a transparent, cloud-native platform, PyreCast strengthens climate resilience while improving affordability, environmental sustainability, and public health outcomes across the state.

C. Goals and Objectives of the Agreement

Agreement Goals
The goals of this Agreement are to:

- Enhance Wildfire Forecasting Capabilities and Strengthen Wildfire Resilience and Risk Mitigation.
    - Improve the spatial and temporal accuracy of wildfire spread predictions using updated models and dynamic input data.
    - Provide tools that support situational decision making, real-time response, and grid resilience. Enable faster and more informed decisions on PSPS and grid asset protection.
- Develop Stakeholder-Centered Solutions and Improve Operational Efficiency for Users.
    - Ensure PyreCast's user interface and features meet the operational needs of IOUs, POUs, emergency responders, and state agencies.

Ratepayer Benefits[7]:
This Agreement is intended to result in the ratepayer benefits of greater electricity reliability, lower costs, and increased safety by enhancing California's wildfire forecasting and mitigation capabilities through the open-source PyreCast platform. By integrating cutting-edge fire behavior models like CAWFE™, near-real-time satellite data, and probabilistic risk visualization, PyreCast will enable electric utilities and emergency responders to make faster, more informed decisions before and during wildfire events. This will reduce unnecessary PSPS, limit infrastructure damage, and improve coordination of suppression resources—ultimately minimizing service interruptions and enhancing operational resilience.

Additionally, the project's advanced benchmarking tools and dynamic risk assessments will support more targeted infrastructure protection and strategic planning. These capabilities will help investor-owned utilities avoid costly emergency repairs and improve grid hardening strategies, translating to lower long-term costs for ratepayers. By reducing the frequency and severity of wildfire-related outages and damage, the project directly contributes to a safer, more

[7] 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.

reliable, and cost-effective electricity system for California.

Technological Advancement and Breakthroughs[7]

This Agreement intends to lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by delivering the first operational, open-source wildfire forecasting platform that combines forecast skill assessment, real-time uncertainty quantification, and user-friendly, public-facing tools. By finalizing the integration of a dynamic coupled weather-fire model like CAWFE™, the project will enable more realistic simulations of wildfire behavior under dynamic atmospheric conditions - particularly in complex fire scenarios driven by fire-induced winds. The platform will also upgrade its existing fire spread models (ELMFIRE and GridFire) using the advanced Pyretechnics library, which supports modeling of surface, crown, and spot fires with high spatial and temporal resolution.

Additional innovations include deploying high-resolution fuels data, integrating near-real-time satellite-derived fuel moisture, and developing a weather microservice to support seasonal fire weather forecasts up to three months in advance. The project will also operationalize performance benchmarking by comparing model outputs with satellite-derived fire progression maps, improving user confidence in forecast accuracy. As part of a broader strategy to strengthen computational capacity and maximize scientific value, PyreCast will incorporate enhancements from other funded initiatives—such as animated uncertainty visualization—positioning the platform as a cornerstone of California's energy resilience and wildfire preparedness and substantially overcoming barriers to the achievement of the State of California's statutory energy goals.

Agreement Objectives

The objectives of this Agreement are to:

- Engage with energy sector stakeholders to 1) identify gaps in currently used toolkits that can be filled by PyreCast adoption, 2) understand usability improvements that would facilitate this adoption, 3) increase stakeholder understanding of the project's scope of work and desired project outcomes, 4) understand if the project has achieved its goals with the initial updates made to PyreCast, and 5) assess whether the stakeholders are likely to adopt PyreCast as part of their toolkit.
- Enhance software and interface based on stakeholder feedback, including addition of seasonal weather and risk forecasting module.
- Integration of a dynamic coupled weather-wildfire behavior model (such as CAWFE) into PyreCast.
- Develop and integrate advanced fuels data into PyreCast.
- Develop methods for performance benchmarking of active fire forecast against satellite derived fire size data.

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).** All products submitted which will be

viewed by the public, must comply with the accessibility requirements of Section 508 of the federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations**.** All technical tasks should include product(s). Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

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

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

For products that require a final version only

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

For all products

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

Instructions for Submitting Electronic Files and Developing Software:

- **Electronic File Format**
  - Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the California Energy Commission's (CEC) 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.

The following describes the accepted formats for electronic data and documents provided to the CEC 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.
- 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 CEC'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, and other CEC staff relevant to the Agreement. The Recipient's Project Manager and any other individuals deemed necessary by the CAM or the Project Manager shall participate in 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., Teams, Zoom), with approval of the CAM.

  The Kick-off meeting will include discussion of the following:
  - The CAM's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Project Schedule;
  - Terms and conditions of the Agreement;
  - Invoicing and auditing procedures;
  - Travel;
  - Equipment purchases;
  - Administrative and Technical products (subtask 1.1);
  - CPR meetings (subtask 1.3);
  - Monthly Calls (subtask 1.5)
  - Quarterly Progress reports (subtask 1.6)
  - Final Report (subtask 1.7)
  - Match funds (subtask 1.8);
  - Permit documentation (subtask 1.9);
  - Subawards (subtask 1.10);

  - Technical Advisory Committee meetings (subtasks 1.11 and 1.12);
  - Agreement changes;
  - Performance Evaluations; and
  - Any other relevant topics.

- Provide *Kick-off Meeting Presentation* to include but not limited to:
  - Project overview (i.e. project description, goals and objectives, technical tasks, expected benefits, etc.)
  - Project schedule that identifies milestones
  - List of potential risk factors and hurdles, and mitigation strategy

- Provide an *Updated Project Schedule, Match Funds Status Letter,* and *Permit Status Letter*, 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:
- Kick-off Meeting Presentation
- Updated Project Schedule (if applicable)
- Match Funds Status Letter (subtask 1.7) (if applicable)
- Permit Status Letter (subtask 1.8) (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 CEC 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 CEC 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 CEC.

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 may 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 CEC, 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 and submit 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.

- 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* with a list of expected CPR participants in advance of the CPR meeting. If applicable, the agenda may 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. A determination of unsatisfactory progress This may result in project delays, including a potential Stop Work Order, while the CEC determines whether the project should continue.
- 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)

CAM Products:

- CPR Agenda(s)
- 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 CEC 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 of the following Agreement closeout items:
    - Disposition of any procured equipment.
    - The CEC's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.

    - Final invoicing and release of retention.
- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide copies of *All Final Products* organized by the tasks in the Agreement.

Products:
- Final Meeting Agreement Summary (if applicable)
- Schedule for Completing Agreement Closeout Activities
- All Final Products

MONTHLY CALLS, REPORTS AND INVOICES

Subtask 1.5 Monthly Calls

The goal of this task is to have calls at least monthly between the CAM and Recipient to verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement on time and within budget.

The objectives of this task are to verbally summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, to verify match funds are being proportionally spent concurrently or in advance of CEC funds or are being spent in accordance with an approved Match Funding Spending Plan, to form the basis for determining whether invoices are consistent with work performed, and to answer any other questions from the CAM. Monthly calls might not be held on those months when a quarterly progress report is submitted or the CAM determines that a monthly call is unnecessary.

The CAM shall:
- Schedule monthly calls.
- Provide questions to the Recipient prior to the monthly call.
- Provide call summary notes to Recipient of items discussed during call.

The Recipient shall:
- Review the questions provided by CAM prior to the monthly call
- Provide verbal answers to the CAM during the call.

Product:
- Email to CAM concurring with call summary notes.

Subtask 1.6 Quarterly 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 *Quarterly 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 reporting period, 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. Progress reports are due to the CAM the 10th day of each January, April, July, and October. The Quarterly Progress Report template can be found on the ECAMS Resources webpage available at: https://www.energy.ca.gov/media/4691

- Submit a monthly or quarterly *Invoice* on the invoice template(s) provided by the CAM.

Recipient Products:

- Quarterly Progress Reports
- Invoices

CAM Product:

- Invoice template

Subtask 1.7 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. When creating the Final Report Outline and the Final Report, the Recipient must use the CEC Style Manual provided by the CAM.

Subtask 1.7.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual* provided by the CAM.

Recipient Products:

- Final Report Outline (draft and final)

CAM Products:

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

Subtask 1.7.2 Final Report

The Recipient shall:

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

  - Body of the report (**required**)
  - References (if applicable)
  - Glossary/Acronyms (If more than 10 acronyms or abbreviations are used, it is required.)
  - Bibliography (if applicable)
  - Appendices (if applicable) (Create a separate volume if very large.)
  - Attachments (if applicable)
- Submit a draft of the Executive Summary to the TAC for review and comment.
- Develop and submit a *Summary of TAC Comments on Draft Final Report* received on the Executive Summary. For each comment received, the Recipient will identify in the summary the following:
  - Comments the Recipient proposes to incorporate.
  - Comments the Recipient does not propose to incorporate and an explanation for why.
- 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.
- Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any comment, provide a *Written Responses to Comments* explaining why the comments were not incorporated into the final product.
- Submit the revised *Final Report* electronically with any Written Responses to Comments within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the CAM specifies a longer time period or approves a request for additional time.

Products:

- Summary of TAC Comments on Draft Final Report
- Draft Final Report
- Written Responses to Comments *(if applicable)*
- Final Report

CAM Product:

- Written Comments on the Draft Final Report

MATCH FUNDS, PERMITS, AND SUBAWARDS

Subtask 1.8 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. 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 application that led to the CEC 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 application that led to the CEC 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.
    - If different from the solicitation application, provide a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

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

Subtask 1.9 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

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

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

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

The goals of this subtask are to: (1) procure and execute subrecipients and site host agreements, as applicable, required to carry out the tasks under this Agreement; and (2) ensure that the subrecipients and site host agreements are consistent with the Agreement terms and conditions and the Recipient's own contracting policies and procedures.

The Recipient shall:

- Execute and manage subawards and coordinate subrecipients activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subaward.
- Include any required Energy Commission flow-down provisions in each subaward, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subaward terms.
- Submit a *Subaward and Site Letter* to the CAM describing the subawards and any site host agreement needed or stating that no subawards or site host agreements are required.
- If requested by the CAM, submit a draft of each *Subaward* and any *Site Host Agreement* required to conduct the work under this Agreement.
- If requested by the CAM, submit a final copy of each executed *Subaward* and any *Site Host Agreement*.
- Notify and receive written approval from the CAM prior to adding any new subrecipient (see the terms regarding subrecipient additions in the terms and conditions).

Products:

- Subaward and Site Letter
- Draft Subawards *(if requested by the CAM)*
- Draft Site Host Agreement *(if requested by the CAM)*
- Final Subawards *(if requested by the CAM)*

- Final Site Host Agreement *(if requested by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.11 Technical Advisory Committee (TAC)

The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the Agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.
- Help set the project team's goals and contribute to the development and evaluation of its statement of proposed objectives as the project evolves.
- Provide a credible and objective sounding board on the wide range of technical and financial barriers and opportunities.
- Help identify key areas where the project has a competitive advantage, value proposition, or strength upon which to build.
- Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in its effort to build partnerships, governmental support, and relationships with a national spectrum of influential leaders.
- Ask probing questions that ensure a long-term perspective on decision-making and progress toward the project's strategic goals.

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 1.12.
- 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 1.12 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* for each TAC Meeting that include any recommended resolutions of major TAC issues.

The TAC shall:

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

- Review and provide comments to proposed project performance metrics.
- Review and provide comments to proposed project Draft Technology Transfer Plan

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

Subtask 1.13 Project Performance Metrics
The goal of this subtask is to finalize key performance targets for the project based on feedback from the TAC and report on final results in achieving those targets. The performance targets should be a combination of scientific, engineering, techno-economic, and/or programmatic metrics that provide the most significant indicator of the research or technology's potential success.

The Recipient shall:
- Complete and submit the project performance metrics section of the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
- Present the draft project performance metrics at the first TAC meeting to solicit input and comments from the TAC members.
- Develop and submit a *TAC Performance Metrics Summary* that summarizes comments received from the TAC members on the proposed project performance metrics. The *TAC Performance Metrics Summary* will identify:
    - TAC comments the Recipient proposes to incorporate into the *Initial Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
    - TAC comments the Recipient does not propose to incorporate with and explanation why.
- Develop and submit a *Project Performance Metrics Results* document describing the extent to which the Recipient met each of the performance metrics in the *Final Project Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
- Discuss the *Project Performance Metrics Results* at the Final Meeting.

Products:
- TAC Performance Metrics Summary
- Project Performance Metrics Results

IV. TECHNICAL TASKS

TASK 2 STAKEHOLDER ENGAGEMENT
The goal of this task is to engage with energy sector participants to identify desired weather, risk, and active fire forecast horizons, use cases for the platform, data outputs, tool functions, interface designs, and other characteristics of a wildfire near-term forecasting tool that would be both useful and feasible.

Exhibit A
Scope of Work
Spatial Informatics Group, LLC

The Recipient shall:

- Develop a *Stakeholder Engagement Plan.*
  - Develop a list of stakeholders (to include representatives from IOUs, POUs, and state agencies).
  - Conduct outreach for stakeholder participation commitment.
  - Develop *Stakeholder Engagement Plan* to include:
    - Stakeholder list (of representatives from IOUs, POUs, and State Agencies)
    - Workshop/Survey Design outlining specific feedback areas such as wireframes, importance of automated performance benchmarking of active fire spread forecasts, seasonal forecasting, etc.
    - Plan, theme, and anticipate outcomes for stakeholder outreach
    - Engagement timeline
- Conduct Initial Stakeholder Engagement
  - Engagement will occur via online surveys, virtual workshops, or other cost-effective methods identified in the *Stakeholder Engagement Plan*.
  - Initial engagement will 1) identify gaps in currently used toolkits that can be filled by PyreCast adoption, 2) understand usability improvements that would facilitate this adoption, and 3) increase stakeholder understanding of the project's scope of work and desired project outcomes.
  - Develop *Stakeholder Engagement Summary and Implementation Plan #1.*
    - Complete a summary of findings and recommendations from the initial survey, workshops, and/or other methods.
    - Outline plan for any immediate platform updates as informed by initial engagement.
- Conduct Intermediate Stakeholder Engagement
  - Conduct up to 6 virtual workshops according to *Stakeholder Engagement Plan* (Task 2.1)
  - Workshops will occur when initial products are developed and will confirm *Software Development Implementation Plan #1* meets users' expectations and needs. Plan will be adjusted as needed and developed to further reflect engagement feedback.
  - Develop *Stakeholder Engagement Summary and Implementation Plan #2*
    - Complete a summary of findings and recommendations from the Intermediate workshops.
    - Include plan on how to operationalize feedback on:
      - User Interface Designs
      - System Specifications
      - Automated performance benchmarking of active fire spread forecasts
      - Seasonal Forecasting
- Conduct Final Stakeholder Engagement
  - Survey, virtual workshops, or other methods identified in the Stakeholder Engagement Plan will assess: 1) whether the project has achieved its goals with the initial updates made to PyreCast and 2) whether the stakeholders are likely to adopt PyreCast as part of their toolkit.

- Complete a summary of findings and recommendations from the final workshops for the Draft Final Report.

Products:

- Stakeholder Engagement Plan
- Stakeholder Engagement Summary and Implementation Plan #1
- Stakeholder Engagement Summary and Implementation Plan #2

TASK 3 PYRECAST REVISIONS IN RESPONSE TO STAKEHOLDER ENGAGEMENT

The goal of this task is to enhance the PyreCast platform user interface and functionality in direct response to input received by stakeholders (Task 2). In addition to input received in Task 2, the Recipient will incorporate advancements in modeling seasonal weather and risk forecasting identified in previous stakeholder engagement.

The Recipient shall:

- Prepare *Summary Report of Updates to PyreCast Platform* including workflow, wireframes and user interface mock-ups representing stakeholder identified updates as well as seasonal weather and risk forecasting and compliance with web accessibility standards.
- Develop software code, complete test deployment of code, conduct internal testing and refinements, and complete deployment of software updates into PyreCast platform for stakeholder testing.
- Develop *Seasonal Forecasting Technical Report* to include methods, workflow, and wireframes for integrating out-season risk and weather forecasting into the PyreCast platform.
- Test PyreCast enhancements with selected stakeholders and refine software code in response to stakeholder testing, complete final deployment of software updates to PyreCast platform.
- Release *Code Repository* and *Supporting Documentation*.

Products:

- Summary Report of Updates to PyreCast Platform
- Seasonal Forecasting Technical Report (Draft and Final)
- Code Repository and Supporting Documentation

TASK 4 INTEGRATION OF DYNAMIC COUPLED WEATHER-WILDFIRE BEHAVIOR MODEL AND PYRETECHNICS INTO PYRECAST

The goal of this task is to integrate the dynamic coupled weather-wildfire behavior model and develop use cases prioritized in the stakeholder engagement process (Task 2). Additionally, this task will develop scripts from Pyretechnics libraries to enable the production of computationally efficient risk and active fire spread outputs for incorporation into the PyreCast platform.

The Recipient shall:

- Integrate dynamic coupled weather-wildfire behavior model (e.g., CAWFE™) with all dependencies into PyreCast cloud infrastructure.

  - Refine and automate workflows for initializing CAWFE™ runs from PyreCast-supplied fire ignitions or mapping data, fuel maps, and meteorological data.
  - Develop wireframes that outline the structure, layout, and functionality of CAWFE™ integration with PyreCast platform (backend architecture and user interface), user interface, with a focus on content and navigation rather than visual design.
  - Produce a *Dynamic Coupled Weather-Wildfire Behavior Model Technical Report*, a narrative description of the backend and user interface wireframes.
- Create configuration preset inputs of dynamic coupled weather-wildfire behavior model for key California fire-prone landscapes (e.g., Wildland-Urban Interface zones, chaparral, Sierra foothills) and co-develop "sandbox" use cases (and configurations) with selected stakeholders.
  - Validate computational efficiency and runtime feasibility for rapid-update cycles (6–12-hour intervals).
  - Develop use cases with electric utilities and fire managers to simulate initial attack, multi-day fires, extreme fire weather anticipating grid ignitions, PSPS events.
  - Produce updated PyreCast user interface displaying dynamic coupled weather-wildfire behavior model outputs that allows users to access, view and display outputs of the model.
  - Create *Dynamic Coupled Weather-Wildfire Behavior Model Summary User Interface Report* reflecting updated PyreCast user interface.
- Develop *Dynamic Coupled Weather-Wildfire Behavior Model User Interpretation Guidance*, including how to understand terrain-induced winds, plume dynamics, and in what situations and for how long dynamic coupled weather-wildfire behavior model offers added value over faster models like GridFire or ELMFIRE.
- Finalize deployment of Pyretechnics model scripts for Active Fire and Risk in PyreCast.
- Develop *Pyretechnics Open-source Code Repository and Supporting Documentation*.
- Prepare a *CPR Report #1* in accordance with subtask 1.3.
- Participate in a CPR meeting.

Products:

- Dynamic Coupled Weather-Wildfire Behavior Model Technical Report
- Dynamic Coupled Weather-Wildfire Behavior Model Summary User Interface Report (draft and final)
- Dynamic Coupled Weather-Wildfire Behavior Model User Interpretation Guidance (draft and final)
- Pyretechnics Open-source Code Repository and Supporting Documentation
- CPR Report #1

TASK 5 INTEGRATION OF HIGH-RESOLUTION FUELS MODEL DATA AND NEAR-REAL TIME SURFACE AND CANOPY FUEL MOISTURE MEASUREMENT INTO PYRECAST

The goal of this task is to integrate and validate methods for high-resolution (10m) Standard Fire

Behavior Fuel Model (FBFM40) fuels data (based on Scott and Burgan 2005[8] categories) for application to Pyrecast wildfire behavior models. In addition, the project team will develop methods to integrate and validate remotely sensed fuel moisture data as input into wildfire behavior models used in PyreCast.

The Recipient shall:

- Develop methods to integrate and validate updated high-resolution (10m) standard Fire Behavior Fuel Model fuels data for use and visualization in the PyreCast platform for the years 2025, 2026 and 2027.
    - Develop *High Resolution Fuels Data Archive* for a sample location containing high resolution fuels datasets and metadata for 2025, 2026 and 2027 for PyreCast platform.
- Integrate fuels from Task 5.1 into risk and active fire forecasts in PyreCast.
    - Develop *High Resolution Fuels Integration Summary Report* on how data are derived and deployed into PyreCast.
- Develop a *Technical Report on High Resolution Fuels and Remotely Sensed Dynamic Surface and Canopy Fuel Moisture Content Data (FMC) Measurements.*
    - Report will include but is not limited to, the use and validity of high-resolution fuel model data and remotely sensed fuel moisture data (FMC) to better measure surface and canopy moisture and integrate data into PyreCast system. The report will include comparative analysis of high-resolution fuel model data to lower resolution fuel model data that was originally used in Pyrecast. In addition, remotely sensed fuel moisture content data will be compared with field-based measurements of fuel moisture content data and fuel moisture content derived from forecasted weather data.

Products:

- High Resolution Fuels Data Archive
- High Resolution Fuels Integration Summary Report
- Technical Report on High Resolution Fuels and Remotely Sensed Dynamic Surface and Canopy FMC Measurements (draft and final)

TASK 6 PERFORMANCE BENCHMARKING OF ACTIVE FIRE FORECASTS

The goal of this task is to develop methods and a workflow to assess the performance of active fire spread forecasts and identify specific data requirements and software development tasks needed to enable near real-time benchmarking of fire spread forecast accuracy.

The Recipient shall:

- Develop methods and design options for fire spread model accuracy workflow and wireframes, and develop microservice software code for automating performance benchmarking of active fire spread forecasts.
    - Develop methods for automated generation of fire perimeters from satellite derived data, leveraging research from UC Irvine (Randerson Lab), which uses 'hotspot' detection data derived from various satellite platforms to estimate 'true' fire

[8] Scott, Joe H., and Robert E. Burgan. *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model*. Gen. Tech. Rep. RMRS-GTR-153. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, June 2005. https://digitalcommons.usu.edu/barkbeetles/66

perimeters for comparison with PyreCast active fire spread forecasts.
    - Design architecture for creating *Performance Benchmarking Active Fire Data Archive* that will allow performance benchmarking.
        - Update microservices software code to automate functionality to create a code repository for all active fire spread model parameters, inputs, outputs, and other metadata related active fire forecasts.
        - Complete *Performance Benchmarking Open-Source Code Repository and Documentation* and *Active Fire Performance Benchmarking Technical Report* for deployed active fire performance benchmarking.
- Develop fire model accuracy wireframes in PyreCast and develop guidance for users on 'best fit' forecast based on performance benchmarking outcomes.
    - Test and deploy new code and *Performance Benchmarking Active Fire Data Archive* for performance benchmarking on PyreCast.
    - Develop *PyreCast User Interface and Guidance on How to Use Benchmarking Functionality*.
- Prepare a *CPR Report* #2 in accordance with subtask 1.3.
- Participate in a CPR meeting.

Products:
- Performance Benchmarking Active Fire Data Archive
- Performance Benchmarking Open-Source Code Repository and Documentation
- Active Fire Performance Benchmarking Technical Report (draft and final)
- PyreCast User Interface and Guidance on How to Use Benchmarking Functionality
- CPR Report #2

TASK 7: EVALUATION OF PROJECT BENEFITS
The goal of this task is to report the benefits resulting from this project.

The Recipient shall:
- Complete *the Initial Project Benefits Questionnaire*. The Initial Project Benefits Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Complete the *Annual Survey* by January 31st of each year. The *Annual Survey* includes but is not limited to the following information:
    - Technology commercialization progress
    - New media and publications
    - Company growth
    - Follow-on funding and awards received
- Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant data collection period' and submitted to the CAM for review and approval.
- Respond to CAM questions regarding the questionnaire drafts.
- Complete and update the project profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the profile link.
- If the Prime Recipient is an Innovation Partner on the project, complete and update the

organizational profile on the CEC's public online project and recipient directory on the Energize Innovation website (www.energizeinnovation.fund), and provide *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile link.

Products:
- Initial Project Benefits Questionnaire
- Annual Survey(s)
- Final Project Benefits Questionnaire
- Documentation of Project Profile on EnergizeInnovation.fund
- Documentation of Organization Profile on EnergizeInnovation.fund

TASK 8: TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES
The goal of this task is to ensure the scientific and techno-economic analysis, and tools developed under this agreement are utilized in the energy policy, and/or planning decisions at the state and/or local levels, academic community and/or commercial sector.

The Recipient Shall:
- Develop and submit a *Knowledge Transfer Plan* that identifies the proposed activities the recipient will conduct to meet the goal of the task. The *Knowledge Transfer Plan* should include at a minimum:
  - Specific policy and planning efforts this project is expected to inform.
  - Specific stakeholder groups and energy policy and planning practitioners who will utilize the results of this project.
- Proposed activities the Recipient will conduct to ensure the tools and results from this project will be utilized and adopted by the groups identified above.
- Present the *Draft Knowledge Transfer Plan* to the TAC for feedback and comments.
- Develop and submit a *Summary of TAC Comments* that summarizes comments received from the TAC members on the *Draft Knowledge Transfer Plan*. This document will identify:
  - TAC comments the Recipient proposes to incorporate into the *Final Knowledge Transfer Plan*.
- TAC comments the Recipient does not propose to incorporate with and explanation why.
- Submit the *Final Knowledge Transfer Plan* to the CAM for approval.
- Implement the activities as described in the *Final Knowledge Transfer Plan.*
- Develop a *Knowledge Transfer Summary Report* that includes high level summaries of the activities, results, and lessons learned of tasks performed relating to implementing the Final Technology Transfer Plan. This report should not include any proprietary information.
- When directed by the CAM, develop presentation materials for an CEC- sponsored conference/workshop(s) on the project.
- When directed by the CAM, participate in the annual EPIC symposium(s) sponsored by the California CEC.
- 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.

Products:
- Knowledge Transfer Plan (draft and final)

- Summary of TAC Comments
- Technology Transfer Summary Report (draft and final)
- High Quality Digital Photographs

V. PROJECT SCHEDULE

Please see the attached Excel spreadsheet.