

**Exhibit A**  
**SCOPE OF WORK**

**TASK LIST**

<b>Task#</b>	<b>CPR</b>	<b>Task Name</b>
1	X	Agreement Management
2		Expand STREET
3		Construct Vehicle and Fuel Infrastructure Modules
4		Develop Vehicle and Fuel Infrastructure Scenarios
5		Perform Parametric Variations within STREET
6		Develop Strategy for Web-based STREET Model

**GLOSSARY OF ACRONYMS**

<b>Acronym</b>	<b>Definition</b>
APEP	Advanced Power and Energy Program, University of California, Irvine
AQMD	Air Quality Management District
BAAB	Bay Area Air Basin
CCM	Commission Contract Manager
CPR	Critical Project Review
DOE	United States Department of Energy
ICE	Internal Combustion Engine
PCA	Preferred Combination Assessment
SJVAB	San Joaquin Valley Air Basin
SoCAB	South Coast Air Basin
STREET	Spatially and Temporally Resolved Energy and Environment Tool
UCI	University of California, Irvine

**GLOSSARY OF TERMS**

<b>Term</b>	<b>Definition</b>
Holistic	Analysis of all facets of a broad integrated system
Module	A building block of STREET
Parametric	Analysis method by which numerous computations are performed by changing parameters
Realistic Scenarios	Spatially and temporally resolved future-year vehicle, and infrastructure scenarios that are likely to occur based on current trends
Spanning Scenarios	Spatially and temporally resolved scenarios that are relatively unlikely, though technologically feasible and that allow a limiting impact of vehicles, fuels and /or infrastructure to be gauged.
Spatial	Geographic location of emission sources, infrastructure and energy use
Temporal	The time of day or year that energy is used and emissions are released

## **GOALS OF THE AGREEMENT**

The goals of this Agreement are to:

- Expand the existing Spatially and Temporally Resolved Energy and Environment Tool (STREET) analysis tool: (A) from a South Coast Air Basin (SoCAB) focus to one that includes specific multiple air basins/regions, throughout all of California, and (B) to analyze a variety of emerging alternative vehicle and fuel options and technology rollout scenarios, as prescribed by the California Energy Commission (Energy Commission).
- Use STREET to parametrically and holistically assess spatially- and temporally resolved greenhouse gas and criteria pollutant emissions, energy use, petroleum displacement, and air quality for several future alternative vehicle scenarios in California.

## **OBJECTIVES OF THE AGREEMENT**

The objectives of this Agreement are to:

- Expand STREET from a regional (air shed) perspective to a State perspective in order to provide the following attributes:
  - Scoping analyses by providing energy consumption, resource consumption and associated emissions as a function of selected parameters and parametric variations of interest
  - Support, as justified, second order “detailed” air quality analyses in major California air sheds
- Construct additional modules for the STREET framework, as requested by the Commission Contract Manager (CCM) to gain insights into a variety of proposed vehicles and vehicle fueling infrastructure options such as biofuels, gaseous hydrocarbons, and varying degrees of vehicle electrification,
- Using the expanded STREET, analyze statewide impacts of the various options upon greenhouse gas emissions, petroleum displacement, resource use, and air quality for any desired vehicle and fueling technology or technology mix, and
- Perform parametric variations using the expanded STREET to assess the different energy and environmental impacts of infrastructure permutations in an effort to discover preferred coordinated vehicle and infrastructure rollout scenarios.

## **BACKGROUND**

Faculty and staff from the Advanced Power and Energy Program (APEP) at the University of California, Irvine (UCI) have developed the UCI STREET model under previous research programs funded by Energy Commission PIER grants and by others. STREET is a tool designed for policy and planning purposes in the field of alternative fuels. The STREET computer model considers, in extreme detail, which fuels vehicles may use, where the fuels are made, where feedstocks and resources come from, how they are transported and along which routes, and where fueling stations might be located. The model can also determine what changes must occur to achieve a desired result.

The purpose of this agreement is to expand the existing STREET to cover the following alternative fuels: Hydrogen, natural gas, ethanol, biomethane/biogas, propane, biodiesel/renewable diesel and electricity. It is also the purpose of this agreement to expand the existing STREET to cover all of California. The Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program (Program) will fund this agreement. The project will address policy decisions regarding strategic placement of alternative fuel vehicles, and alternative fuel distribution and fueling infrastructure. In addition, it will create a model that will eventually serve as a user interface for Energy Commission staff and the general public.

The deployment of new transportation systems and fuels will require a broadly coordinated effort and substantial capital investment of private and public funds. This may include the implementation of new stationary power generation and distribution technologies in California as well. As a result, it is important to plan a clear strategy that will most effectively lead to greenhouse gas reductions and petroleum use reduction, and that will support the air quality goals driving this effort. The analytical capabilities of STREET can be used by Energy Commission staff to determine environmental impacts to better inform decisions regarding diverse technology investment and funding strategies.

Funding support from three programs was used to develop and implement key attributes of STREET. The first and foremost is the multi-year funding support of the Commission program to develop, in collaboration with the Air Resources Board and the South Coast Air Quality Management District, the methodology to characterize and assess air quality impacts associated with power generation and transportation alternatives. The second is funding support from the California Department of Transportation for the development and implementation of a methodology to establish the number and locations of fueling stations in a given community. The third is the U.S. Department of Energy DOE funding support that addressed the foundation of STREET, namely the development and implementation of the "Preferred Combination Assessment (PCA)" methodology. All three programs have been successfully completed.

The application of the STREET methodology to hydrogen infrastructure deployment in the SoCAB has established that it is robust, readily adaptable to the variety of parameters and technologies that must be included, and effective at establishing the needed insights.

The current and potential capabilities of STREET can directly inform the Program initiatives by assessment of vehicle and fuel infrastructure scenarios of interest to the Energy Commission. This scope of work describes an initial three-year effort to formally establish and utilize STREET in the Energy Commission's Program, and to determine if both the utility and applicability of STREET justify continued use beyond the three-year duration of the project. The vehicles/fuels of immediate consideration are electric drive/electricity, fuel cell/hydrogen, Internal Combustion Engine (ICE)/hydrogen, ICE/ethanol, ICE/renewable diesel/biodiesel, ICE/natural gas, and ICE/propane. The scope of work allows for expansion to other alternative fuels as needed.

## **SCOPE OF WORK TASKS**

### **TASK 1 AGREEMENT MANAGEMENT**

#### **MEETINGS**

##### **Task 1.1 Attend Kick-off Meeting**

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

##### **The Contractor shall:**

- Attend a “kick-off” meeting with the CCM, the Commission Project Technical Lead, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the CCM to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the CCM will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Terms and conditions of the Agreement
- Critical Project Review (CPR) Meetings (Task 1.2)

The technical portion of the meeting shall include, but not be limited to, the following:

- The CCM’s and the Commission Project Technical Lead’s expectations for accomplishing tasks described in the Scope of Work;
- The Schedule of Deliverables and Due Dates (update as required)
- Monthly Progress Reports (Task 1.4)
- Deliverables (Task 1.5)
- Final Report (Task 1.6)
- Technical Tasks (Tasks 2 through 6)

The CCM shall designate the date and location of this meeting.

##### **CCM Deliverable:**

- Updated Schedule of Deliverables (as required)

##### **Task 1.2 Critical Project Review Meetings**

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

Critical Project Review (CPR) meetings provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs will take place annually, beginning one year from the start date of this Agreement, unless the CCM determines otherwise. The CCM may schedule additional CPRs as necessary, and, if necessary,

the budget will be reallocated to cover the additional costs borne by the Contractor, but the overall contract amount will not increase.

Participants include the CCM, the Commission Project Technical Lead, and the Contractor, and may include other Energy Commission staff and management selected by the CCM to provide support to the Energy Commission.

**The CCM shall:**

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks, subject to the Terms and Conditions on amendments to the agreement. If the CCM concludes that the project needs a formal amendment, that satisfactory progress is not being made and the project needs to be ended, or that the project does not meet the needs of the Energy Commission and a stop work should issue, these conclusions will be referred to the Commission's Transportation Policy Committee for its concurrence.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

**The Contractor shall:**

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted to the CCM at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

**CCM Deliverables:**

- Agenda and List of Expected Participants
- Schedule for Written Determination
- Written Determination

**Contractor Deliverables:**

- CPR Report(s)

### **Task 1.3 Final Meeting**

The goal of this task is to closeout this Agreement.

#### **The Contractor shall:**

- Meet with the CCM to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Contractor and the CCM. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the CCM.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The CCM will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the CCM about the following Agreement closeout items (if applicable):

- What to do with any state-owned equipment (Options), if applicable
  - CCM's request for specific "generated" data (not already provided in Agreement deliverables)
  - "Surviving" Agreement provisions
  - Final invoicing
- Prepare a schedule for completing the closeout activities for this Agreement.

#### **Deliverables:**

- Closeout Schedule

### **REPORTING TASKS**

#### **Task 1.4 Monthly Progress Reports**

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement.

#### **The Contractor shall:**

- Prepare monthly progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. (See Attachment A-2) Each progress report is due to the CCM within 10 working days after the end of the reporting period.

#### **Deliverables:**

Monthly Progress Reports

### **Task 1.5 Deliverables**

The goal of this task is to set forth the general requirements for submitting deliverables, unless described differently in the tasks descriptions.

When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the CCM, the latest version of the Commission's Style Manual published on the Energy Commission's website at:

[http://www.energy.ca.gov/contracts/consultant\\_reports/index.html](http://www.energy.ca.gov/contracts/consultant_reports/index.html)

#### **The Contractor shall:**

- When directed to submit both a draft and final deliverable under the Scope of Work, submit a draft of each deliverable to the CCM for review and comment in accordance with the approved Schedule of Deliverables. The CCM will provide written comments back to the Contractor on the draft deliverable within 15 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the CCM, who shall provide written approval (or dispute) of the final deliverable within 10 working days of receipt.

### **Task 1.6 Final Report**

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The CCM and Commission Project Technical Lead will review and approve the Final Report. The Final Report must be completed before the termination date of the Agreement, in accordance with the Schedule of Deliverables and Due Dates.

The Final Report shall follow the approved outline and the latest version of the Final Report guidelines as published on the Energy Commission's website. The current guidelines are published at:

[http://www.energy.ca.gov/contracts/consultant\\_reports/index.html](http://www.energy.ca.gov/contracts/consultant_reports/index.html)

The contractor shall use the latest version of these guidelines that is available at the time the Recipient begins performing this task, unless otherwise instructed in writing by the CCM.

The Final Report shall be a public document. If the Contractor has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Contractor shall perform the following subtasks for both the public and confidential versions of the Final Report.

#### **Task 1.6.1 Final Report Outline**

##### **The Contractor shall:**

- Prepare and submit a draft outline of the Final Report
- Prepare and submit a final outline of the Final Report

##### **Deliverables:**

- Draft Final Report Outline
- Final Report Outline

## **Task 1.6.2 Final Report**

### **The Contractor shall:**

- Prepare and submit the draft Final Report for this Agreement in accordance with the approved outline
- Prepare and submit the Final Report

### **Deliverables:**

- Draft Final Report
- Final Report

## **ELECTRONIC FILE FORMAT**

### **Task 1.7 Electronic File Format**

The goals of this task are to unify the formats of electronic data and documents provided to the CCM as contract deliverables, and to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

### **The Contractor shall:**

- Deliver documents to the CCM in the following formats:
  - Data sets shall be in Microsoft Office file formats. All deliverable files must be saved in MS Office 2007 or earlier format(s). For MS Access data files, data set file size, quality, and length must be specified.
  - PC-based text documents shall be in MS Word file format.
  - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
  - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

### **Deliverables:**

- Exemption Request(s) (if applicable)

## **TECHNICAL TASKS**

### **TASK 2 Expand STREET**

The goal of this task is to expand STREET analytical capabilities, previously developed only for the SoCAB, to encompass the entire state of California. The product will be the revised STREET that is fully operational to assess vehicle and fueling options regionally and throughout the state of California.

### **The Contractor shall:**

- Expand the Preferred Combination Assessment (PCA) methodology within STREET, which was developed for SoCAB for all alternative fuels, to a statewide analysis tool as directed by the CCM.

- Configure existing air quality simulation tools for the SoCAB, the SJVAB, and the BAAB, such that the expanded PCA results can be readily applied.
- Prepare a report detailing the expansion of STREET to encompass the entirety of California. The report shall include:
  - Detailed explanation of PCA methodology and the steps taken to expand the capability to include all of California.
  - Detailed description of air quality modeling methodology and configuration of simulation tools required to model each CA air basin.
- Prepare a Power Point Presentation that includes the Final STREET Expansion Report.
- Present the PowerPoint at a workshop and participate in a discussion about the scope and direction of the work. Demonstrations shall be included as needed. The time, date, and location of the workshop will be determined by the CCM, but generally will take place at the Energy Commission.

**Deliverables:**

- Draft STREET Expansion Report
- Final STREET Expansion Report
- Power Point Presentation with demonstration at workshop

**TASK 3 Construct Vehicle and Fuel Infrastructure Modules**

The goal of this task is to construct new alternative vehicle and alternative fueling infrastructure modules and incorporate them into the STREET framework. This will allow the user to holistically analyze pertinent vehicle and fuel infrastructure scenarios such as vehicle electrification, increased use of natural gas, and expanded biodiesel opportunities. UCI (through APEP) and the CCM will work together to develop various alternative transportation scenarios and vehicle rollout plans. The work products will include modules for electric drive/electricity, fuel cell/hydrogen, ICE/hydrogen, ICE/ethanol, ICE/renewable diesel/biodiesel, ICE/natural gas, and ICE/propane. The modular framework of STREET readily allows APEP and the Energy Commission to interactively determine and model a wide range of vehicle and fuel infrastructure combinations.

**The Contractor shall:**

- Expand the PCA methodology by developing additional STREET modules to include the transportation fuels identified in the *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*.  
<http://www.energy.ca.gov/2010publications/CEC-600-2010-001/CEC-600-2010-001-CTF.PDF>
- Prepare a STREET Module Development Report detailing the development of the following street modules:
  - Fuel cell/hydrogen, ICE/hydrogen,
    - Replicate the fuel cell vehicle and hydrogen infrastructure scenarios previously developed for SoCAB for the entire state.
  - Electric drive/electricity
    - Model the impacts of electric vehicle charging profiles by incorporating the temporal resolution of current electric infrastructure in combination with additional future power generation technologies.

- ICE/natural gas (or Biomethane/Biogas), and ICE/propane
  - Model fuel production, delivery, and dispensing of natural gas fuels (CNG, LNG) and Propane using the methods similar to those used to model hydrogen.
- ICE/ethanol (or gasoline substitutes/renewable hydrocarbons), ICE/renewable diesel/biodiesel (or diesel substitutes/renewable hydrocarbons)
  - Analyze bio-fuel production and distribution.
- Consider at least two additional potential fuels and vehicle systems of interest by adding additional modules to the STREET framework. The CCM will determine which fuels and vehicle systems will be added.
- Prepare a Power Point Presentation that includes the Final STREET Module Development Report.
- Present the PowerPoint at a workshop and participate in a discussion about the scope and direction of the work. Demonstrations shall be included as needed. The time, date, and location of the workshop will be determined by the CCM, but generally will take place at the Energy Commission.

**Deliverables:**

- Draft STREET Module Development Report
- Final STREET Module Development Report
- Power Point Presentation with demonstration at workshop

**TASK 4 Develop Vehicle and Fuel Infrastructure Scenarios**

The goals of this task are to develop realistic and spanning scenarios for potential combinations of alternative vehicles and fuels, and use the expanded STREET to holistically assess greenhouse gas and pollutant emissions, resource usage, and air quality impacts. It is likely that multiple alternative vehicles and fuels will be commercially successful in the future and these scenarios predict the potential combinations and fleet mixes that are possible.

**The Contractor shall:**

- Develop the array of realistic and spanning vehicle and fuel infrastructure scenarios for analysis in consultation with the CCM. The strengths of both organizations will be leveraged to generate highly detailed, future vehicle and fuel infrastructure scenarios that APEP will use as inputs to the STREET analysis tool.
  - Consult Energy Commission staff on scoping, scenarios and infrastructure planning.
  - Utilize Energy Commission experience, in combination with an understanding of the STREET capability, to develop scenarios.
- Utilize STREET to determine greenhouse gas emissions, criteria pollutant emissions, energy consumption, and resource usage for future vehicle and fuel infrastructure scenarios.
  - Run at least one hundred fifty vehicle and fuel infrastructure scenarios using the Preferred Combination Assessment (PCA) component of STREET.
  - Run at least thirty air-quality case simulations for the SJV, SoCAB, and BAAB, based on the results of the PCA analyses, and as identified by the CCM and APEP.

- Prepare a detailed Scenario Development and Results Report based on the research performed in this task.
- Prepare training materials for STREET to train Energy Commission staff and stakeholders. Training materials shall include but are not limited to, training manuals/binders, slideshows/presentations, interactive how-to-guides/step-by-step guides, screenshots, posters, and videos.
- Prepare a Power Point Presentation that includes the Final Scenario Development and Results Report.
- Present the PowerPoint at a workshop and participate in a discussion about the scope and direction of the work. Demonstrations shall be included as needed. The time, date, and location of the workshop will be determined by the CCM, but generally will take place at the Energy Commission.

**Deliverables:**

- Draft Scenario Development and Results Report
- Final Scenario Development and Results Report
- Draft STREET Training Materials
- Final STREET Training Materials
- Power Point Presentation with demonstration at workshop

**TASK 5 Perform Parametric Variations within STREET**

The goal of this task is to parametrically vary vehicle and fueling infrastructure scenarios within STREET to determine preferred scenarios for reducing greenhouse gas and criteria pollutant emissions and for minimizing non-renewable resource utilization.

**The Contractor shall:**

- Use the expanded STREET to assess incremental changes in vehicle penetrations and infrastructure build-out, over time, to quantitatively assess greenhouse gas emission, air quality, energy use, and resource consumption impacts.
  - Based on parametric analysis, the results will indicate preferred vehicle and fuel scenarios to achieve the best greenhouse gas and pollutant emission reductions.
- Meet with the CCM to identify specific high-resolution air quality simulations and scenarios. For each scenario that has been identified, run the STREET air quality simulation attribute that provides concomitant spatially- and temporally-resolved high-resolution air quality data.
- Prepare a detailed Perform Parametric Variations Scenario Results Report of scenario results based on the research performed in this task.
- Prepare a Power Point Presentation that includes the Final Perform Parametric Variations Scenario Results Report.
- Present the PowerPoint at a workshop and participate in a discussion about the scope and direction of the work. Demonstrations shall be included as needed. The time, date, and location of the workshop will be determined by the CCM, but generally will take place at the Energy Commission.

**Deliverables:**

- Draft Perform Parametric Variations Scenario Results Report
- Final Perform Parametric Variations Scenario Results Report
- Power Point Presentation with demonstrations at workshop

## **TASK 6 Develop Strategy for Web-based STREET Model**

The goal of this task is to develop a strategy for STREET to be used as a web-based tool in the future by Energy Commission staff and the general public. This site will be hosted and maintained on UCI systems.

### **The Contractor shall:**

- Develop a strategy for enabling the Energy Commission to utilize a web-based STREET model, with the potential to make it available to the general public.
- Prepare a Web-Based STREET Model Interface Strategy Report t presenting the strategy and documenting its development. This task shall be completed once the model has been fully vetted and tested by the Contractor and the CCM.
- Develop a user interface (screen mask system with input and output options for running scenarios on the STREET model) that is designed in a simple fashion so that no special skills are required for its use.
- Prepare a Power Point Presentation that includes the Final Web-Based STREET Model Interface Strategy Report and web-based interface of the STREET model.
- Present the PowerPoint at a workshop and participate in a discussion about the scope and direction of the work. Demonstrations shall be included as needed. The time, date, and location of the workshop will be determined by the CCM, but generally will take place at the Energy Commission.

### **Deliverables:**

- Draft Web-Based STREET Model Interface Strategy Report
- Final Web-Based STREET Model Interface Strategy Report
- Power Point Presentation with demonstration at workshop