

**Proposed Agreement between California Energy Commission
and
The Regents of the University of California, - CIEE**

Title: Addressing Barriers to Electric Fuel Scale-up in California
Amount: \$200,000.00
Term: 9 months
Performing Inst: Institute of Transportation Studies, TRSC
Contact: Philip Misemer
Committee Meeting: 5/18/2010

Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
05	Electric	Transportation	Transportation Systems	\$200,000	\$200,000	\$0	0%

Recommendation

Approve this MRA Work Authorization with The Regents of the University of California, CIEE for \$200,000.00. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

Issue

California's State Alternative Fuels Plan shows that the maximum penetration of alternative fuels at 5,309 million gasoline gallon equivalents (gge) by 2022. This is over half of the total transportation energy consumption projected for 2022. Seven percent of this amount (about 376 million gge) is projected to be electricity, which, after correcting for electric vehicle efficiency, is equivalent to 4.5 billion kilowatt-hours; enough electrical energy to service nearly 750,000 average homes for one year. Unlike homes, plug-in electric vehicles (PEVs) are concentrated, large, mobile loads that can impact the electric system across dimensions of location (e.g., clusters of PEVs charging in adjacent houses), time (charging demand could occur at any time) and location (PEVs will be moving across utility district boundaries, thus a "moving load"). The existing California electricity regulatory framework was established prior to the advent of the smart grid and numerous advances in vehicle batteries. This situation has prompted the CPUC to initiate an Order to Institute Rulemaking (OIR 09-08-009) on electricity as an alternative vehicle fuel.

Providing electric fuel will require coordination, and perhaps linkages, among technologies, markets, regulations and policies. Questions relevant to this coordination include:

- How should electricity provided to vehicles be treated differently (if at all) from electricity for other purposes? What is the relationship between fuel electricity, smart grid technologies, and electricity provision more generally?
- How might carbon credits be assigned to the extent that increased demand for e-fuel enables greater penetration of renewables?
- Under various scenarios, what are the likely impacts of increased demand for e-fuel on utility grids, and what needs to be done to manage any problems?

- What are opportunities for utility control of plug-in vehicle charging to help manage demand, and can needs for direct control be reduced or eliminated through pricing or other policies?
- How might e-fuel infrastructure be appropriately and fairly rate-based? What "infrastructure" is appropriate to include? Is there a way for the additional requirements needed to support e-fuel to be recouped fairly but without creating additional barriers to e-fuel adoption?
- Given potential scenarios of e-fuel market penetration and availability and cost of advanced battery packs for electric vehicles, what other policy and regulatory strategies are available to help assure e-fuel successfully contributes to state environmental and energy-use goals?
- How can policy and regulatory structures affect second use of traction batteries?

Background

Depending on how it happens, e-fuel scale-up in California could either facilitate the capture of many potential benefits or exacerbate the already formidable challenges facing the electrical system. And the web of potential players - potential beneficiaries and burden-bearers, service providers and regulatory authorities - involved in the tectonic collision between the transportation and energy sectors is complex.

Uncertain, widespread commercialization of PEVs presents significant challenges for the strategic and regulatory coordination, planning, and policy development that will be necessary to not only successfully support the largest possible number of plug-in vehicles with electric fuel (e-fuel), but to capture and maximize the many potential benefits to the electrical system that could arise from smart control and utilization of e-fuel-charging and battery-second-life-storage systems. Among the smart-charging and/or battery-storage opportunities at stake are:

- Demand-response management;
- Peak shaving/shifting and increasing the capacity factor of the grid;
- Transmission, distribution, and generation support and upgrade deferral;
- Ancillary/grid services; and
- Renewables firming and carbon reduction.

This research builds on previous work on e-fuel and battery-second-life strategies as well as activities with the PUC and utility groups at the Renewable and Appropriate Energy Laboratory, and will coordinate the near-term technology, regulatory and policy requirements of e-fuel scale-up in California.

Proposed Work

The proposed project will be conducted by the Transportation Sustainability Research Center (TSRC) at UC Berkeley, and will consist of four interrelated project tasks: 1) assessment of lessons learned from previous related alternative fuel commercialization experiences; 2) development of 2011-2010 scenarios of e-fuel vehicle commercialization in California; 3) a stakeholder workshop; and 4) project management and reporting activities.

The research will encompass two broad tasks:

1) Develop a near-term picture of e-fuel scale-up in California through investigation of various scenarios that distinguish fuel electricity requirements from electricity as a whole (and their potential rate-bases), consider different degrees of direct utility involvement, and that explore various related factors (e.g., plug-in-vehicle commercialization rates, required/allowed charging levels, demand-response, e-fuel related costs, carbon credit allocation, etc.).

2) Conduct and document a regulatory policy stakeholder workshop using the above "straw man" scenarios to enhance coordination between CARB, CPUC, utility, and CEC representatives about near-term e-fuel scale-up requirements and challenges.

The California Public Utilities Commission's (CPUC) Alternative Fuels Order Instituting Rulemaking (R09-08-009) considers alternative-fueled vehicle tariffs, infrastructure and policies needed for utilities to ready the electric system for the projected statewide market growth of PHEV's and EV's to support California's greenhouse gas emissions reduction goals. As a result of PHEV's and EV's entering the market, rulemaking was initiated to consider the impacts EV's may have on the State's electric infrastructure and what actions should be taken to ensure that the charging of these vehicles does not adversely impact our electric system in terms of reliability.

The overall goals of this research are to:

- Refine the concept of "electric fuel" and vehicles as an advantageous and possibly revolutionary technology for significant reductions in energy use and GHG emissions;
- Quantify the grid impacts and potential benefits of PEVs as they interact with utility grids in various ways, include as storage and ancillary service providers;
- Identify key policy opportunities to enable PEV market penetration as appropriate given established GHG and other environmental and social benefits; and
- Assess and provide policy guidance on the confluence of policies to support PEVs, and how additional state-level policy development can be most advantageously applied given the existing array of state and federal policies (e.g, ZEV mandate, federal fuel economy regulations, federal and state vehicle incentives, etc.).

Justification and Goals

This project "[will develop, and help bring to market] advanced transportation technologies that reduce air pollution and greenhouse gas emissions beyond applicable standards, and that benefit electricity and natural gas ratepayers" (Public Resources Code 25620.1.(b)(1)), (Chapter 512, Statutes of 2006)); and supports California's goal to research, develop, and demonstrate alternative fuel production technologies, emphasizing in-state resources per the Integrated Energy Policy Report 2005.