

Survey of Project Concepts for the Alternative and Renewable Fuel and Vehicle Technology Program

The California Energy Commission (Energy Commission) is in the early planning stage developing an Investment Plan and other program aspects for this new program. Energy Commission staff seek suggestions of concepts as we develop this new transportation funding program which, among other goals, seeks to reduce greenhouse gas emissions from mobile sources.

Significantly more staff work is still necessary before the program is ready to release an official solicitation, expected in the spring of 2009. This survey is intended to be used as an early reconnaissance tool to help Energy Commission staff gauge the interest and magnitude of funding that could be allocated for the Alternative and Renewable Fuel and Vehicle Technology Program.

This survey allows you to share concepts that you think would advance Alternative and Renewable Fuel and Vehicle Technologies. It is important that you include the funding level recommended for each concept. For the first year we anticipate \$75 million. For survey purposes please assume that this program will annually administer \$100 million over seven years. Please submit a separate survey for each concept.

THIS IS NOT A SOLICITATION. YOUR RESPONSE TO THIS SURVEY CREATES NO OBLIGATION ON YOUR PART OR ON THE PART OF THE ENERGY COMMISSION.

Survey Questions: (Responses should not exceed four pages, no graphics except simple schematic diagrams.)

- Describe the concept; identify specific goals, technology and the plan to bring the project to completion.
- Describe the funding needs, term of the funding, amount of state and other sources needed. Describe the funding needed per-widgit (if appropriate).
- Describe the expected results, in terms of gasoline or diesel fuel displaced, and greenhouse gas emission reductions, or other appropriate metric.
- Describe how this project idea would be compatible with sustainability goals and standards. Summarize the environmental data you have (and or provide links to any related references) assembled to meet the sustainability goal standards.

Please check the below boxes that best characterizes the concept:

Project Type

- ☐ Fuel Production
- ☐ Fuel Transport/Storage/Blending Facility
- ☐ Fuel Infrastructure (Station, Pump, Electric Charging Facility, Fueling System)
- ☐ Vehicle Deployment (Fleet, Consumer)
 - ☐ Light-Duty
 - ☐ Medium-Duty
 - ☐ Heavy-Duty
- ☒ Vehicle/Engine Technology or Components
- ☒ Performance Test/ Protocol Development
- ☐ Workforce Training, Public Outreach, Education
- ☐ California Manufacturing Plant
- ☐ Other _____

Fuel/Technology

- ☐ Electric Drive ☐ Plug-in Hybrid EV
 - ☐ Batter Electric Vehicle
 - ☐ MD/HD Hybrid or Hydraulic Hybrid
 - ☐ Non Road Electric
 - ☐ Other _____
- ☐ Natural Gas (CNG, LNG)
- ☐ Renewable Diesel/Biodiesel
- ☐ Hydrogen
- ☐ Ethanol
- ☒ Propane
- ☐ Vehicle Efficiency
- ☒ Other: Portable propane power system

Development Stage

- ☒ Widespread commercial Availability-Consumer Acceptance
- ☒ Early Market Deployment/Development
 - ☐ Fleets
 - ☒ Consumers
 - ☐ Fuel Producers
 - ☐ Infrastructure owners
 - ☐ Manufacturing Plants
- ☐ Market Niche Demonstration and Feasibility
- ☒ Application Research and Development (Validation Test, Prototype Development)
- ☐ Other _____

CEC AB118 Project Survey

Alternative and Renewable Fuel and Vehicle Technology Program

Liquid Propane Application Development

LEHR Incorporated

Description of the Concept:

LEHR Incorporated has developed and patented a fueling system technology that allows portable outdoor power equipment to run on cleaner, greener, less expensive propane rather than polluting gasoline. In addition to increased convenience, durability, and reliability, LEHR propane powered products are proving easier to fuel, start, use, maintain and store.

The core technology is developed and patented. LEHR is now focusing on developing applications of the technology to replace gasoline in outdoor power equipment. Our first product, the EcoTrimmer (a propane powered string trimmer) has been introduced to the consumer market. LEHR has identified upwards of 40 potential applications of the core technology. Each application requires engineering, tooling, testing, certification and sample production validation.

Each new application, depending on the level of tooling, certification and testing, can cost as little as \$300,000 or as much as \$1,000,000. LEHR is already in the CAD design and rapid prototype phase on a propane powered leaf-blower, a propane-powered lawn mower, a propane powered generator, a propane powered pressure washer, and a propane powered steam washer. In addition, we are negotiating engineering assistance in the development of a commercial grade (300 hour certified) propane powered engine the likes of which does not currently exist in the marketplace.

LEHR would like to introduce new products to the marketplace on a timely basis during the course of 2009, with introductions starting as early as May 2009 and continuing throughout the year at regular intervals.

Funding Needs

LEHR plans to commit up to \$4,300,000 in 2009 for new product development, testing, certification, and production/quality engineering. Toward this end, we are devoting a portion of current product sales as well as raising equity from investors to fund the product pipeline.

Product/Project	Budget	Duration
Commercial Engine (300 hour)	\$1,000,000	12 months
Farm Use Engine (125 hour) Testing	\$100,000	4 months
Leaf Blower Development (Consumer)	\$300,000	5 months
Lawn Mower Development (Consumer)	\$350,000	7 months
Pressure Washer/Steam Washer Development	\$350,000	5 months
Generator Development (Consumer)	\$600,000	5 months
String Trimmer Development (Commercial)	\$450,000	5 months
Leaf Blower Development (Commercial)	\$450,000	5 months

Lawn Mower Development (Commercial)	\$450,000	5 months
DOT Approved Refillable Tank Development	\$250,000	7 months
TOTAL	\$4,300,000	

Gasoline Displacement

A 16.4 ounce propane canister powers the LEHR EcoTrimmer an average of 2 hours and 20 minutes in an average use scenario. A gallon of gasoline powers similar gasoline trimmers for the same amount of time. This means that a quart of liquid propane gas is equivalent to one gallon of gasoline. As our new products are developed, we expect similar gasoline displacement performance.

As to Greenhouse gas emission reductions, Propane emits 60% less CO than gasoline¹. LEHR string trimmer engine tested at the following levels compared to the EPA Phase III standards for this class of non-road engines.

TABLE 1 OF § 1054.103.—PHASE 3		
EMISSION STANDARDS FOR HANDHELD ENGINES (G/KW-HR)		
Standard for 2011		
Engine displacement class	HC+NOX	CO
EPA Standard for Class IV Engine	50	805
LEHR Propane Engine	17.3	203.4
LEHR vs. Standard	-65.4%	-74.7%

A standard not measured, but equally important to the EPA is evaporative emissions. Gasoline, when evaporated, releases carcinogenic and ozone depleting chemicals into the air. LEHR propane products are sealed system products. LEHR offers ZERO EVAPORATIVE EMISSIONS. Something no gasoline product can claim.

Compatibility with Standards

Currently, gasoline outdoor power equipment is estimated to contribute to 5% of overall air pollution. According to the Propane Education and Research Council (PERC), EPA, and/or the California Air Resources Board; propane:

- Emits 99% fewer ultra-fine particulates than gasoline
- Emits zero evaporative emissions
- Contains 96% fewer cancer causing chemicals compared to gasoline which emit benzene and toluene².
- Emits zero ozone depleting chemicals

¹ World LP Gas Association 2003 and California Energy Commission, January 2003

² Southwest Research Institute

Gasoline used in such equipment:

- Pollutes in one hour as much as 40 cars run for an hour³
- Produces 87 tons of smog in a single day from evaporation and use (equivalent to the fumes from 1,000,000 cars in a single day⁴).

There are other environmental considerations not measured by the use of propane equipment, but by the increase in safety and sustainability provided by LEHR propane powered equipment.

- The EPA reports that 17 million gallons of gasoline are spilled each year as a result of refilling gasoline powered outdoor power equipment. This spillage evaporates into the air and penetrates local aquifer contaminating groundwater.
- Additionally, the average price of power equipment holds one quart of gasoline, however, gasoline containers hold one gallon of gasoline. In two stroke engines, the gasoline must be blended with oil. In four stroke engines, it can be added as is. Gasoline has a shelf life of 6-8 weeks without adding stabilizers. Small engines in outdoor power equipment cannot successfully run on gas that has deteriorated so people tend to pour the bad gas down the drain or on their lawns. Either way, it harms the environment.

Sustainability Goals

Propane provides a unique blend of economic and environmental benefits as an alternative to gasoline and diesel fuels. Propane is able to meet and exceed the minimum environmental performance measurers set forth in the Commission's Sustainability (draft) Framework. By nature, propane has low carbon content as a C_3H_8 molecule; yet propane has one of the highest energy values per gallon (Btu) of any of the alternative fuels, while delivering impressive vehicle and engine performance. Propane also has extended durability, improved reliability, and the distribution infrastructure for portable propane canisters and refilling is already in place. One can buy the canisters in more locations than one can buy gasoline.

Propane engines tend to last 2-3 times longer with fewer repairs and troubles from wear and tear. This is because whereas gasoline is a solvent (which breaks down oil's viscosity and lubricating ability) propane is not thereby assuring lower maintenance cost and longer lasting oil and engines. Currently, the average string trimmer lasts 2-3 years after which it is too expensive to repair or service and less expensive to buy a new one still under warranty. This adds to landfill.

Propane is a nontoxic fuel and complies with all local, state and federal laws regarding adverse effects to state natural resources and CEQA compliance. In addition, propane engines help to achieve and maintain both federal and State Ambient Air Quality Standards, as propane engines meet and/or exceed both EPA and CARB certification standards. (see above)

³ United States Environmental Protection Agency

⁴ California Air Resources Board 2001

As mentioned above, propane is a nontoxic fuel and will not contaminate waterways, aquifers or water supplies. In the event of a spill or fuel leak, propane is highly reactive when released into the ambient air, propane swirls and dissipates very quickly and does not leave behind any filmable or toxic residue. As a result, propane tends to breakdown quickly and has a short lifespan in the atmosphere which is also advantageous from a climate change prospective in comparison to other fuels.

Summary

The average homeowner runs their lawn and garden equipment 3-5 hours per year. For each and every piece of gasoline powered equipment replaced by propane power, this saves 2 gallons of gasoline in actual use and potentially another two gallons from waste by lack of use. Also, when using portable power equipment, the user is walking directly behind or next to an engine spewing gasoline exhaust. Tantamount to jogging with your nose attached to a pace car tailpipe, reducing emissions to the much lower propane levels instantly creates a healthier environment for equipment users and others.

Exchanging gasoline equipment for LEHR propane powered equipment will have an immediate positive effect on the environment. Furthermore, LEHR has discovered through the deployment of its first EcoTrimmer product, that it can offer alternatives to gasoline power at a competitive price, with superior performance, greater reliability, and without the dangers of gasoline use and storage.

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