CEC AB118 Project Survey

Alternative and Renewable Fuel and Vehicle Technology Program

Liquid Propane Injection Engine & Vehicle Development

CleanFUEL USA, LLC

PROJECT CONCEPT

In recent years, the propane industry has taken several bold steps toward re-establishing the engine fuel market. In 2004, the industry turned a corner and began focusing on all engine fuel applications as a cohesive segment. The creation of the Propane Education & Research Council's (PERC) Engine Fuel Advisory Committee strengthened the industry's focus on all viable engine fuel applications and the business models that demonstrate their merit to propane marketers and customers alike. The propane industry has adopted a comprehensive approach to market development through R&D and safety training, while building relationships with industry interests and government policymakers to improve consumer education and awareness and product development.

In close collaboration with PERC, CleanFUEL USA (CFUSA) will develop, validate, certify and commercialize mono-fueled LPI (Liquid Propane Injection) system for several General Motors and Ford engines and vehicle platforms. In addition, we are in the process developing OEM branded heavy-duty engines for the transit market, D-Type school bus, ports and goods movement for true HD commercial applications such as bobtail delivery and utility service applications.

In light of the limited space available for this survey, the General Motors 6L Project will be used as a project example: GM GEN-IV 6.0L engine fitted in light and medium-duty G3500 and G4500 cutaway vans; 2500 and 3500 HD pick-up trucks; cargo vans, N-Series cab-forward medium duty trucks and the Workhorse Chassis platforms for the UPS delivery van development project. The GEN-IV 6.0L engine replaced all older versions of the engine, with a GM projected life in the market of at least 5 years. CFUSA research indicates that more than 6,000 of the Savanna / Express vans, in various configurations can be sold in the next four years of production to such markets as airports, hotels, and para-transit agencies. The initial van cutaway platform should yield an additional 10 million gallons of propane per year by 2012. Additional 6.0L engine families will also increase this volume annually. The system will be certified for both OEM approved modification center installation and a very controlled dealer-level aftermarket installation.

The public demand for this application, for both new vehicles sales and in-service vehicles, is based on intelligence from CFUSA's current GM Master Dealer network, engineering contractors, customer response and Internet-based research. This research was validated with data from both, RL Polk and Ward. GM reported sales numbers of all 6.0L applications, coupled with the receptiveness of the market to different commercial applications dictates that the Savannah / Express G3500 / G4500 cutaway and cab chassis 2500 / 3500 HD pick-up (bed delete) will be the first engine family certification.

As environmental regulations and emission standards tighten, and rising fuel economics return to threaten the viability of diesel and gasoline, this new engine will play a vital role in offering fleet operators a practical alternative. Airports, hotels, shuttle services and transit markets present opportunities for propane's lower CO_2, low-NOx, low-sulfur and near-zero particulate properties (EPA cert 0.004 / CARB cert 0.00), along with cost effective infrastructure and fuel cost savings for fleet operators.

Additionally, the industry will continue to work toward reducing emissions by focusing on fuel system technology, improving fuel quality, infrastructure upgrades and deploying innovative refueling equipment that can provide zero to near zero fugitive emission strategies during the refueling process.

FUNDING NEEDED

The GM 6L project will consist of five (5) distinct project phases (checkpoints), each one building on the previous over an 18 month period. The project checkpoints are as follows:

Checkpoint 1 – Project Planning & Acquisition

Checkpoint 2 – Product and Process Definition & Feasibility

Checkpoint 3 – Product and Process Design & Development

Checkpoint 4 – Product and Process Validation

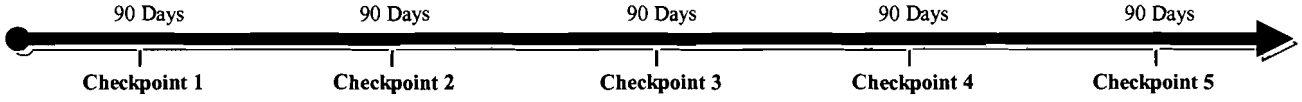
Checkpoint 5 – Production

PROPOSED BUDGET

Proposed Budget for CEC 118 Funding Request Allocation: $1,063,192

Services/Tasks	Ck 1	Ck 2	Ck 3	Ck 4	Ck 5	Total
Engineering	$51,750	$47,875	$47,875	$51,125	$59,875	$258,500
Design	$14,400	$28,800	$21,600	$19,080	$18,000	$101,880
Prototype	$25,000	$17,500	$17,500	$17,500	$25,000	$102,500
CAE	$6,500	$9,750	$9,750	$5,200	$3,900	$35,100
Materials	$100,400	$135,000	$135,000	$100,000	$75,000	$545,400
Travel	$5,000	$5,000	$5,000	$5,000	$5,000	$25,000
Outside Services	$35,000	$100,000	$495,000	$35,000	$28,500	$693,500
Commercialization	-	-	$75,000	$115,000	$94,500	$284,500
Project Management / Reporting	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
Sub Total:	$248,050	$353,925	$816,725	$357,905	$319,775	$2,096,380
CFUSA In-Kind: (49%)	($119,025)	($171,962)	($403,362)	($173,952)	($154,887)	($1,023,188)
PSG In-Kind: (0.5%)	($2,000)	($2,000)	($2,000)	($2,000)	($2,000)	($10,000)
CEC 118 Funding: (50.5%)	**$127,025**	**$179,963**	**$411,363**	**$181,953**	**$162,888**	**$1,063,192**

PROJECT TIMELINE



DISPLACEMENT AND EMISSION REDUCTIONS

Approximately 90% of the United States' propane supply is produced domestically, while the remaining 10% is imported from Canada. Approximately 55% of propane comes from natural gas processing and 45% comes from the refining of crude oil, with California production more equally split between the two feedstocks. Thus, propane is a readily available energy source that is a byproduct that consumes very little additional energy to produce. Propane is one of the nation's most common liquefied motor fuels. It is also one of the most versatile sources of energy as it supplies about 4% of the United States' total domestic energy needs. It is the third most used energy source worldwide and is the number one alternative to gasoline, fueling more than 10-million vehicles globally and displacing nearly 20-billion gallons of gasoline on a GGE basis. Propane on a MPG basis displaces ~86% of gasoline and ~67% of diesel when used as an alternative transportation engine fuel. Propane also emits ~25% less GHG tailpipe emissions that gasoline, and on a full lifecycle analysis, propane reduces GHG emissions by at least 10%. However, new low emission equipment such as motor fuel tanks that do not

release fugitive emissions during the filling process and ultra low emission filling nozzles greatly reduce emissions during fuel transfers.

The results of a comparative analysis of propane's ability to reduce GHG emissions that was sponsored by the Propane Education & Research Council (PERC), and prepared by Energetics Inc. in 2007; show that propane is among the most attractive options for avoiding GHG in internal combustion engine applications, as well as other industry segments. A full copy of this comparative analysis has been submitted to the CEC AB118 docket. At the point of use, propane has a lower carbon content than gasoline, diesel or ethanol. Natural gas is a viable alternative fuel that we support and natural Gas (methane) generates marginally fewer carbon dioxide (CO_2) emissions per Btu than propane, but natural gas is chemically stable when released into the air and produces a global warming effect 25 times that of carbon dioxide. This means that one pound of methane produces the same effect on climate change as 25 pounds of carbon dioxide. With propane's short lifetime in the atmosphere and low carbon content, it is advantageous from a climate change perspective in comparison to other fuels in many applications. The graphs listed on page-4 of this survey demonstrate propane's climate change performance across the applications analyzed in the mentioned PERC analysis of GHG performance.

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 vehicle range, lower cost of vehicle upfit conversion, and affordable infrastructure costs.

Propane is also consistent with State climate change policies such as the Low Carbon Fuel Standard and AB32 provisions and provides the State with a powerful tool to reduce GHG emissions by at least 10 percent on a LCA, while delivering at least 23% fewer GHG tailpipe emissions than gasoline. Propane is a hear today technology that serves as a powerful bridging strategy to 2030 and 2050 goals

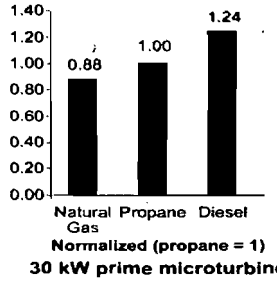
Propane is a nontoxic fuel and complies with all local, state and federal laws regarding adverse effects to state natural resources and CEQA compliance. In addition, propane vehicles help to achieve and maintain both federal and State Ambient Air Quality Standards, as propane engines meet and/or exceed both EPA and CARB certification standards. As an example; the CleanFUEL USA - GM 8.1L engine currently available in both medium and heavy duty trucks is registered with the IRS under the federal AFV tax credit and is eligible for an additional 30 percent credit because the propane engine is "substantially" cleaner than the standard. While propane engine emission technologies continue to improve, the propane industry is also moving forward with educational and deployment strategies to reduce fugitive emissions from the point of fuel production and distribution all the way to the end user. CleanFUEL USA (CFUSA) as well as a growing list of propane marketers in CA deploy ultra low refueling nozzles that have an industry low (2cc) emission release upon disconnect when refueling. CFUSA certified vehicles also deploy fuel tanks that have both mechanical and electronic fuel level shutoff controls, so the tank does not need to be vented during the refueling process which also reduces emissions. 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.

Looking to the future, PERC (Docket #12335) has released a RFP seeking projects to examine possible methods of producing synthetic propane from coal, bio-crud and biomass. Current research suggests propane may have promising renewable characteristics to improving environmental factors that world influence the creation of synthetic or bio-propane on a large marketable scale.

Propane's Performance of Climate Change Compared to Other Fuels in Many Applications

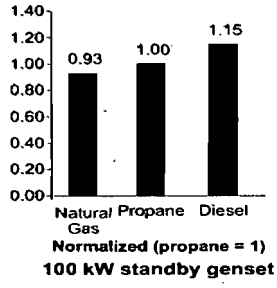
(Propane emissions = 1, and all other fuels are normalized against it for comparison)

Distributed Generation



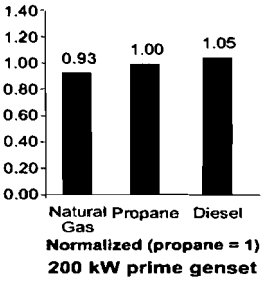
Normalized (propane = 1)

30 kW prime microturbine



Normalized (propane = 1)

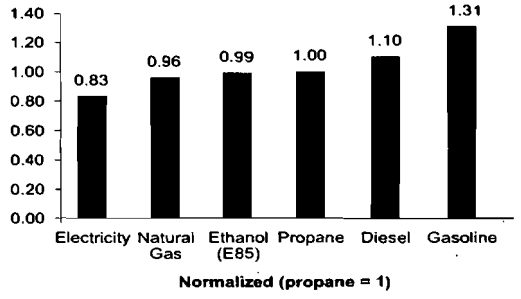
100 kW standby genset



Normalized (propane = 1)

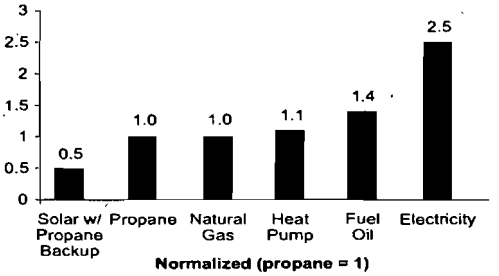
200 kW prime genset

Irrigation Pumps



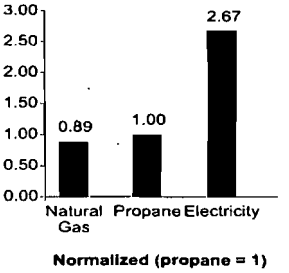
Normalized (propane = 1)

Residential Water Heaters



Normalized (propane = 1)

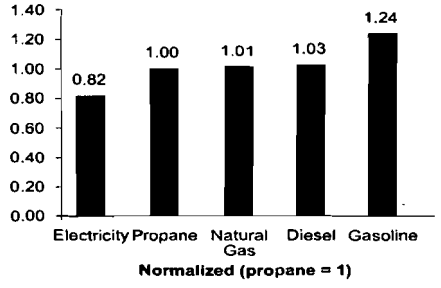
Storage Tank Heater



Normalized (propane = 1)

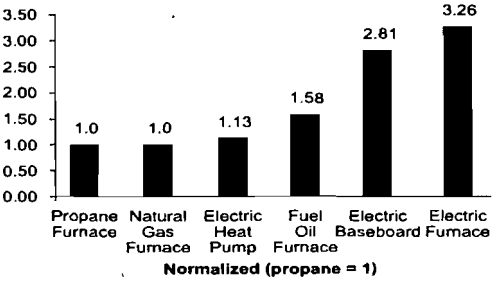
Tankless Water Heater

Forklifts



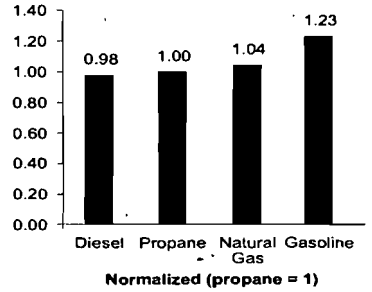
Normalized (propane = 1)

Residential Space Heating



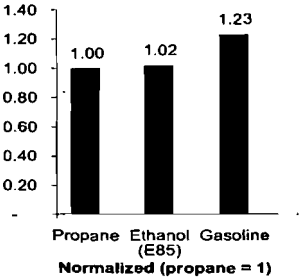
Normalized (propane = 1)

Medium-Duty Engines



Normalized (propane = 1)

Light-Duty Trucks



Normalized (propane = 1)