California Energy Commission
Public Interest Energy Research (PIER) Program
TRANSPORTATION ENERGY RESEARCH

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Natural Gas Engine and Vehicle Integration Research

September 2011

Fact Sheet

The Issue

Transportation is the single largest contributor to California's greenhouse gas (GHG) emissions, producing about 39 percent of the state's total emissions. California is also the third largest consumer of transportation fuels in the world, consuming almost 16 billion gallons of gasoline and more than 4 billion gallons of diesel each year. The State Alternative Fuels Plan identifies certain alternative fuels – including natural gas – that can substantially reduce GHG emissions while reducing petroleum dependence. This research would increase the use of natural gas as a transportation fuel by developing advanced natural gas engine technologies that will address regulatory and economic barriers.

Project Description

The project goal is to develop, integrate, and demonstrate three compressed natural gas (CNG) engines, which are equipped with a three-way catalyst technology. The three engines will be used in refuse, transit, and other Class 8 heavy-duty truck applications. These engines will also comply with the California Air Resources Board (ARB) 2010 heavy-duty emissions standards. The National Renewable Energy Laboratory will be the principal investigator for three project teams.

The first project is with Cummins Westport, Inc. to develop and optimize a spark-ignited 11.9- liter CNG engine suitable for refuse and other vocational Class 8 applications.

CNG Powered Refuse Truck
Photo Credit: Cummings Westport, Inc.

The engine will then be integrated into a variety of chassis configurations, which will be followed by field testing under different ambient and driving conditions. This will validate the engine and chassis configurations for heavy-duty truck applications. Vehicle fleet demonstrations for this project include:

- Waste Management, Oakland, California
- Walmart, Apple Valley, California
- Ecology, Santa Fe Springs, California

The second project is with Emissions Solutions, Inc., who will develop engine hardware and controls to convert a 13-liter Navistar diesel engine to a CNG engine. This includes engine mapping and calibration of the engine management system.

The engine will be optimized for Class 8 short- and long-haul applications. The third project is with the Southwest Research Institute to convert an 11-liter Doosan conventional CNG engine to a more efficient and higher performance engine, and integrate it into a refuse truck. The fleet demonstration plans are to be determined. However, areas being targeted include transit bus demonstrations in the Los Angeles area.

PIER Program Objectives and Anticipated Benefits for California

This project will help develop and bring to the market advanced transportation technologies that reduce air pollution and greenhouse gas emissions beyond applicable standards, and that benefit electricity and natural gas ratepayers. These benefits include:

- Developing natural gas engines having commercial viability within three to five years and capable of meeting or exceeding ARB 2010 emission requirements.
- Integrating a natural gas engine and fuel storage system into a commercially viable medium- to heavy-duty chassis and vehicle.
- Demonstrating a fully integrated natural gas vehicle while proving fuel economy and emissions performance benefits, identifying and quantifying operational and/or performance challenges, and documenting in-service performance of developed products.

As a transportation fuel, natural gas could offset more than 750 million gallons of diesel per year by 2022. This would be a savings of about $1.35 billion per year and would reduce greenhouse gas emissions.

Project Specifics

Contract Number: 500-10-053
Contractor: National Renewable Energy Laboratory
City/County: Lakewood, Colorado
Application: Nationwide
Contract Amount: $4,250,000
Cost share: $5.2 million National Renewable Energy Laboratory
Cofunding: $5 million U.S. Department of Energy
Cofunding: $2.9 million South Coast Air Quality Management District
Contract Term: June 2011 to June 2014

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