



## THE CHALLENGE FOR ENERGY SECURITY AND CLEAN AIR

The steady increase in vehicles and travel on our roads and highways is driving an ever-increasing demand for oil imports. With much of the worldwide oil reserves located in politically volatile countries, the United States is vulnerable to disruptions in supply. At the same time, the increase in oil consumption is contributing to the degradation of the air quality in many of our cities. Economic and environmental concerns are both national and international in scope. The U.S. Environmental Protection Agency (EPA) has mandated strict and very challenging emission requirements for heavy-duty vehicles in 2004 and 2007. Low emission technologies and low emission vehicles are critical to meeting the challenge for energy security and clean air.

## NATURAL GAS VEHICLES ARE CRUCIAL TO THE SOLUTION

The U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL) are responding to these national concerns. DOE has identified the development of next generation natural gas vehicles (NGVs) as a key element in its strategy to reduce oil imports and vehicle pollutants.

Natural gas is a clean-burning, abundant, domestically available fossil fuel that is considered by many to be the vehicle fuel of choice in the long-term transition to a more sustainable energy future. Natural gas (compressed and liquefied) is also promising in terms of cost competitiveness, vehicle performance, and low emissions of regulated pollutants.

## DEVELOPING NEXT GENERATION NATURAL GAS VEHICLES

Because medium- and heavy-duty vehicles burn more fuel and emit more pollution per mile than other vehicles, DOE and NREL are leading the Next Generation Natural Gas Vehicle Program to develop advanced, commercially viable, medium- and heavy-duty NGVs. These new vehicles will incorporate alternative fuel vehicle technologies that are being developed by DOE and others to meet stricter emission regulations. The primary objective of this program is to develop two new NGVs for commercial service—a medium-duty (Class 3-6) compressed natural gas (CNG) vehicle and a heavy-duty (Class 7-8) liquefied natural gas (LNG) vehicle. Examples of the trucks that may be developed in the program could include a medium-duty CNG parcel delivery truck and a heavy-duty LNG trash hauler.

## TECHNICAL TARGETS FOR VEHICLES

The near-term target for the program is to develop a heavy-duty LNG vehicle and a medium-duty CNG vehicle by 2004 that meet an emission goal of 0.5 g/bhp-h  $\text{NO}_x$  (oxides of nitrogen) and 0.01 g/bhp-h PM (particulate matter). The long-term target is to introduce heavy- and medium-duty vehicles before 2007 that meet the 2007 EPA emission regulations (0.2 g/bhp-h  $\text{NO}_x$ ).

## CUSTOMER AND INDUSTRY INVOLVEMENT

Underscoring their commitment to develop and introduce NGVs that are commercially attractive and viable, DOE and NREL have enlisted the support of fleet customers, the NGV industry, and California air quality and energy agencies to advise and collaborate on identifying vehicle needs and on optimum paths to achieve the program goals. Their active involvement has enabled close cooperation with other development programs, avoiding duplication and wasted effort. Furthermore, the industry and California agencies can ensure that adequate fueling and maintenance infrastructure is



ready when the vehicles are delivered. Because of the magnitude of the challenge of developing technology and vehicles, the South Coast Air Quality Management District and the California Energy Commission are also directly supporting this program financially. The vehicles are being developed with the direct involvement of all key stakeholders.

The resulting vehicles will target advanced emission and efficiency targets. Engine and chassis original equipment manufacturers will engineer the vehicle and engine technologies.

To ensure that vehicles resulting from this program are commercially viable, potential vehicle owners and operators are being encouraged to participate. Opportunities for involvement include participation in

- Vehicle planning and development strategy.
- Outlining needs in the areas of vehicles, engines, or other research for consideration by DOE, NREL, and other partners in project planning.
- Providing test sites and on-site support for technology and vehicle evaluations.
- Evaluating incentive packages for purchasing and operating NGVs.
- Purchasing a fleet of vehicles developed during the course of the program.

## PROGRAM PROGRESS

Work is currently in progress on Phase 1 of the program to examine and evaluate technologies that have the potential to achieve 0.5 g/bhp-h NO<sub>x</sub> or lower in medium- and heavy-duty engines. These include:

- Advanced ignition technologies
- Stoichiometric and lean burn engine technologies
- Exhaust gas recirculation
- Advanced aftertreatment technologies such as particulate filters and lean-NO<sub>x</sub> adsorbers

Work is also in progress to develop data on market needs, feasible designs (chassis and powertrain), and customer interest for medium- and heavy-duty vehicles.

Phase 1 work is being supported by industry partners, including:

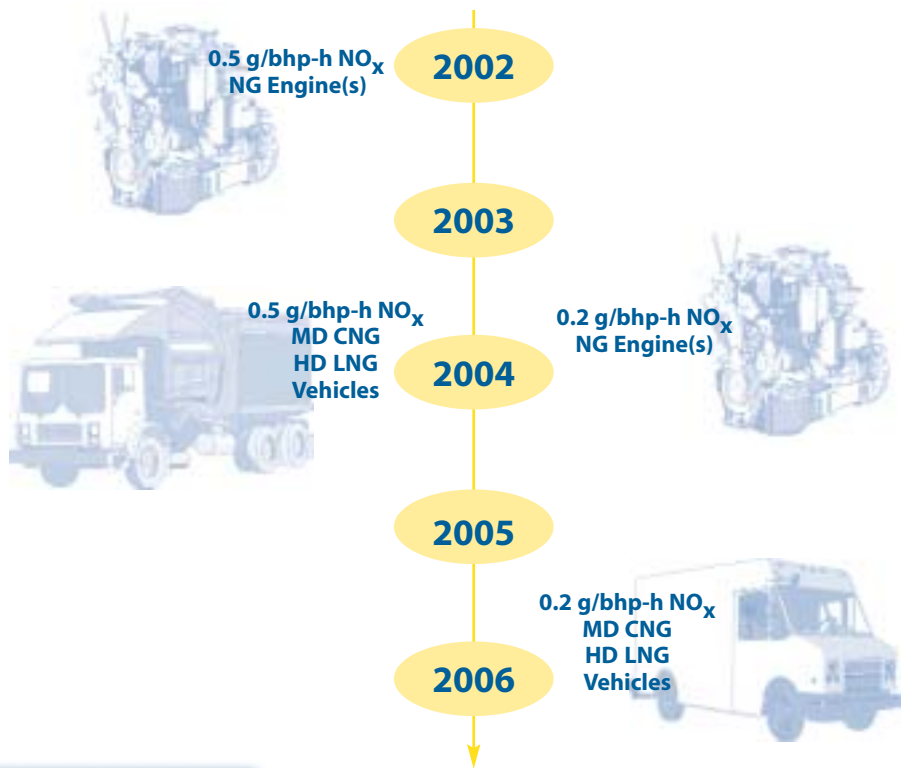
- AD Little, Inc.
- EmeraChem (formerly Goal Line Environmental Technologies)
- Clean Air Partners, Inc.
- Cummins Westport Inc.
- Engelhard
- Ford Motor Company
- Gas Technology Institute
- General Motors
- GFI Control Systems, Inc.
- PACCAR
- Westport Innovations

Phase 2 of the program (initiated in 2002) will emphasize development and integration of 0.5 g NO<sub>x</sub> engines into commercial platform. This will lead to 0.2 g/bhp-h NO<sub>x</sub> or lower emission engine in commercially viable vehicles before 2007.

## HOW TO GET INVOLVED!

Visit [www.ctts.nrel.gov/ngngv](http://www.ctts.nrel.gov/ngngv) to provide your input online and add your name to the program distribution list. For more detailed information, contact the individuals noted below.

## TECHNOLOGY TIMELINE



## FOR FURTHER INFORMATION, CONTACT

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## Web Sites

Next Generation Natural Gas Vehicle Program: [www.ctts.nrel.gov/ngngv](http://www.ctts.nrel.gov/ngngv)

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