

**Statement of John German
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Before the

Select Committee on Energy Independence and Global Warming

U.S. House of Representatives

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Mr. Chairman, good morning. My name is John German, Manager, Environmental and Energy Analyses, American Honda Motor Co., Inc. Thank you for the opportunity to appear before the House Select Committee on Energy Independence and Global Warming to present our views on the benefits of natural gas vehicles (NGV), the state of the NGV market and the role that natural gas vehicles should play in developing a comprehensive plan for solving our energy and climate change challenges.

Background

Development of a variety of technologies is accelerating in response to serious concerns about dependence on petroleum, energy security and global warming. Global demand for transportation energy is extensive and, as a result, no single technology can possibly be the solution. There are no simple obvious solutions – we are going to need rapid development and implementation of as many feasible technologies as possible. Honda is developing technologies that meet both the needs of our customers and those of society. We, at Honda, are constantly exploring a variety of technologies to achieve energy sustainability.

Honda has a long-standing track record of introducing technologies to lower emissions, improve energy conservation, and increase fuel economy. When Honda engineers sought to develop a near zero emissions internal combustion vehicle in the early 1990's, natural gas was recognized as the logical clean burning fuel for a variety of reasons:

- Hydrocarbon emissions from the engine are very low relative to gasoline powered vehicles. Natural gas is already a gas, so it mixes better with air and helps to eliminate byproducts and unburned hydrocarbons in the combustion process. Also, enrichment of the fuel is not needed during cold starts.
- The hydrocarbons that are emitted are mostly CH₄, which has extremely low photochemical reactivity and therefore has little impact on air quality.
- Natural gas requires a sealed fuel storage and delivery system, so it has no evaporative emissions.
- Compressed natural gas has extremely low upstream emissions and little impact on air quality throughout the fuel manufacturing and distribution cycle.

- Natural gas has less carbon content than petroleum, and thus lower CO2 emissions.
- Dedicated natural gas vehicles can operate at higher compression ratios for better efficiency and lower CO2 emissions.

Honda developed a dedicated natural gas vehicle, our Civic GX, that addressed some of the limitations of earlier alternative fuel vehicles (e.g. performance and range), and aimed to contribute to U.S. energy policy goals with an alternative fuel vehicle that displaced petroleum and diversified the energy mix used for transportation. Natural gas offers significant benefits, as it operates cleanly and efficiently in internal combustion engines and works in a variety of vehicle applications (from buses and trucks to small cars). It also has a lower ratio of carbon to energy output, reducing greenhouse gas emissions. In other parts of the world, compressed natural gas vehicles are a mature industry where the technology is widely adopted and well understood. Thus, there is a worldwide supply of compressed natural gas components, although Honda is sourcing some key components for the Civic GX in the U.S., including the storage tank.

Civic GX

Honda is the only OEM vehicle manufacturer that currently offers a dedicated compressed natural gas passenger vehicle, the Civic GX, for the U.S. market. First introduced in 1997, the GX is produced at Honda's East Liberty motor vehicle manufacturing plant in Ohio. The Civic GX has a 4-cylinder, 16 valve i-VTEC engine with an eight gasoline gallon equivalent (gge) fuel capacity. The GX has a range of up to 220 miles. Federal tax incentives up to \$4,000 currently exist for the Civic GX. Non-financial incentives such as HOV lane access under federal law and in some cases, special parking privileges under state or local laws are also available. Historically, sales have stayed between 500 – 1000 vehicles on an annual basis. However, Civic GX demand is now at an all-time high and the market is growing due to the combination of high gasoline prices, concerns about energy security and the introduction of a home refueling station.

Recognized for its very low emissions, the Civic GX achieves near zero smog emissions. It was the first internal combustion vehicle to meet the requirements for the stringent California Air Resources Board's (CARB) light-duty super ultra-low emissions vehicle (SULEV) and for the advanced technology partial zero emission vehicle (AT-PZEV). The GX achieves the EPA's inherently low emissions vehicle (ILEV) status, and at its launch in 1998 was lauded by the Environmental Protection Agency as the "Cleanest Internal Combustion Engine on Earth." Today, the Civic GX remains at the top of the American Council for Energy-Efficient Economy (ACEEE) Greenest Car listings, as it has for every year since the ACEEE began rating vehicles in 1998.

The price of the Civic GX is approximately \$25,000, which can be more than a comparable gasoline engine car. The Civic GX comes with all of the attributes consumers expect and desire in today's vehicles (6 air bags, anti-lock brakes, air conditioning, etc.). The price premium, due primarily to the increased expense of key components such as specialty tanks and fuel systems, could be lowered with increased

volume. However, when compared to plug-in hybrid electric vehicles, fuel cell vehicles and battery EVs, the cost increment for natural gas vehicles is much less. Electricity from the U.S. grid on a well-to-wheel basis has significant greenhouse gas and air quality emission consequences. Several well-to-wheel analyses show natural gas vehicles with superior benefits compared to plug-in hybrid electric vehicles. (See Appendix A).

Home Refueling – Phill™

Despite challenges in marketing the Civic GX to fleets, Honda has stayed the course and recently began a more aggressive effort to market the vehicle to retail customers with a home-refueling option. The natural gas home-refueling station, called Phill™, was developed by fuel makers with Honda's assistance. It taps into the customer's residential natural gas line, connects to the vehicle and fills the tank overnight. It automatically shuts off when the tank is full. All that is needed for installation is a utility supplied natural gas line and a dedicated electrical outlet. The Phill™ expands the refueling opportunity for natural gas beyond what is possible with petroleum fuels, taking advantage of widespread natural gas supply network to homes. Our customers typically refuel at night, so that the small electric use for operating the home refueling device occurs in the off-peak, overnight period, which is another plus. The superior convenience of home-refueling is a major attraction to many customers. Customer feedback that Honda received during its electric vehicle efforts consistently lauded the benefits of the home-refueling option. The cost of Phill™ generally falls in the \$4,000 to \$5,000 range, plus installation. We expect this cost to drop with higher sales. There are also Federal tax incentives, up to \$1,000 for the installation of a Phill™ device. Certain states offer additional incentives.

Nearly every alternative fuel has a major challenge with infrastructure – the so-called “chicken and egg” problem: no infrastructure until there are vehicles, no vehicles until there can be a robust infrastructure. The promise of home refueling tunnels through that problem and enables the infrastructure to grow with the vehicle on a one-to-one basis. Additionally, home refueling allows the public infrastructure to develop with less stress.

Natural gas use in medium and heavy-duty fleets has proven extremely successful in reducing greenhouse gas emissions and petroleum consumption. Light duty natural gas vehicles have the prospect of furthering those investments as well.

Mile for mile, natural gas is less expensive than gasoline, particularly at residential rates. The fuel cost gap between compressed natural gas and gasoline is now sufficient to refocus consumers on the need for alternatives. The cost of compressed natural gas can be as much as \$3.00 less (home refueling at \$1.00 to \$1.50 compared with gasoline at \$4.00 to \$4.50). Every gasoline gallon equivalent of natural gas used displaces one gallon of gasoline and cuts CO₂ emissions by 25%.

Biogas

Non-fossil and renewable methane gas (biogas) are being extensively studied and are promising alternative fuels. Producing fuels from cellulosic biomass would be much more efficient and environmentally friendly than producing ethanol from corn. However, fermentation of cellulosic feedstocks is much more difficult than fermenting corn and other food starches. Other methods of breaking down cellulose are also being developed and evaluated, such as pyrolysis and gasification. Gasification may well prove to be the best method of extracting hydrocarbons from cellulose.

Another method of producing biomass is already in use. As sewage and other organic material degrade in an oxygen-free environment, biogas consisting mostly of methane and carbon dioxide is produced. Its use as a vehicle fuel is currently limited, due to the extra cost and complexity involved to turn the biogas into a liquid fuel for use in conventional vehicles.

Biogas has the potential for major reductions in fossil fuel use and CO₂ emissions. Using biogas directly in natural gas vehicles would save considerable expense and could help establish a viable market for gasification of cellulosic materials.

Pathway to Hydrogen

Natural gas and natural gas vehicles are also a pathway to hydrogen-fueled transportation. Many of the components in natural gas vehicles are similar, such as storage tanks, dispensers, and plumbing, as well as the physical properties of natural gas and hydrogen. Individuals who drive natural gas vehicles today will serve as the innovators of hydrogen tomorrow. Likewise, natural gas dealership service technicians and fueling station builders are the apprentices today for hydrogen tomorrow. In terms of emissions, fuel cell vehicle well-to-wheel CO₂ emissions are reduced 60% when hydrogen is produced from natural gas. Greenhouse gas emissions are near zero when hydrogen is produced from renewables.

For Honda, our work with natural gas vehicles has been a great learning experience that can be applied to our efforts with hydrogen and our fuel cell vehicles. With natural gas being the base fuel in many cases for producing hydrogen, Honda is developing an innovative Home Energy Station (HES) that generates hydrogen from natural gas. The station produces heat and electricity for the home through fuel cell cogeneration as well as creating a supply of hydrogen for a fuel cell vehicle. Honda began work in 2003 on the Home Energy Station concept. Through research conducted in cooperation with technology partner Plug Power, Inc. of New York, refinements have been incorporated that made HES II and III more compact and convenient. The fourth generation HES design in operation at Honda's Torrance, California R&D center incorporates a stationary fuel cell stack innovation that can switch from hydrogen refining to power generation, helping to reduce size and improve efficiency. Such a system has the potential to allow

households to go off the electric grid during the (peak) day, or even provide energy to the grid.

Conclusion

Natural gas vehicles can and should be part of any comprehensive plan to reduce our nation's dependence on foreign oil while working to reduce harmful greenhouse gas and local air emissions. Dedicated natural gas vehicles offer the opportunity for a one-to-one reduction in petroleum use. Expanding the use of natural gas vehicles will be dependent on the product being cost competitive and expansion of infrastructure.

Although supplies of natural gas are not unlimited and it will never be the predominate fuel for vehicles, the energy and global warming challenges are so immense that we need to do everything we can. Recognizing the need to utilize all of the technologies available to us to achieve reductions in greenhouse gas emissions from the transportation sector, natural gas vehicles are one of those important near term technologies, especially if gasification of cellulosic feedstocks becomes available. Natural gas may also be a core fuel for what may be our best long term technology-fuel cell vehicles with hydrogen extracted from natural gas.

This concludes my statement and I would be happy to address any questions.