

**Critical National Need Idea (Our Country Should  
Promote the Use of CNG as a 2nd Fuel in All Our  
Vehicles)**

**Submitting Organization**

Katta G. Murty  
Department of Industrial and Operations Engineering  
University of Michigan  
Ann Arbor, MI-48109-2117, USA  
Phone: 734-763-3513  
Fax: 734-764-3451  
webpage: <http://www-personal.umich.edu/~murty/>  
e-mail: [murty@umich.edu](mailto:murty@umich.edu)  
23 December 2008.

**Keywords:** CNG (Compressed Natural Gas), Vehicle Fuel.

## Our Country Should Promote the Use of CNG as a 2nd Fuel in All Our Vehicles

Katta G. Murty  
Department of Industrial and Operations Engineering  
University of Michigan  
Ann Arbor, MI-48109-2117  
Phone: 734-763-3513; e-mail: murty@umich.edu  
Webpage: <https://www.personal.umich.edu/~murty>  
23 December 2008.

“NG” is “natural gas”; and “CNG” is “Compressed natural gas”. At the moment, our country is blessed with much more abundant resources of NG than crude oil. With the result that we have to import over 70% of our crude oil needs, worsening our negative trade balance along with all its economic consequences.

NG is a highly portable fuel. We use NG for heating homes, but we also use large quantities of it to generate electricity which is not the best way of using this valuable fuel. Conversion of NG into electricity results in a loss of over 65% of the energy in it in the conversion process. So instead of converting NG to electricity and then using that electricity for some work; if that work can also be carried out directly by using NG, it is much better to do it this way.

Over 20% of our electricity generation uses CNG as fuel. In only one or two states, CNG is used as transportation fuel. Over most of the country currently either gasoline or diesel are used as transportation fuel by vehicles.

### CNG As Transportation Fuel

Several countries (India, Brazil, Australia, etc.) have already been using CNG as a second fuel for their vehicles for a long time; and this option is very popular in those countries because even at today’s low prices of crude oil, drivers find that their transportation expenses are about 30% less when they use CNG as fuel.

In these countries they convert any gasoline based vehicle into a dual fuel vehicle using either gasoline or CNG as fuel by installing a **conversion kit**. These conversion kits are currently being made in Italy. The installation of this conversion kit in the vehicle costs the equivalent of about US\$ 800, and takes only a couple of hours. At that time they put a sturdy steel cylinder container for CNG (one cylinder with a rated capacity to hold 12 kg of CNG in the trunk for a car, several larger cylinders each with a rated capacity to hold 20 kg in buses or trucks). They put a switch on the dashboard in front of the driver’s seat for switching from one fuel to another, and an outlet for filling CNG by the side of the traditional gasoline tank outlet. In an average car the steel cylinder

holding about 10 to 12 kg of CNG at very high pressure (typically 3000 psi) gives typically about a 120 mile driving range.

Most gas stations in these countries sell CNG and gasoline or diesel. They have a compressor which takes NG from the supply line, and compresses it to the high pressure; and filling a vehicle with CNG takes only a few minutes at a gas station. These compressors are currently made in Argentina. For the gas station it costs about the equivalent of US\$ 100,000 to have the compressor installed so that it can begin selling CNG.

Most drivers in these countries keep some liquid fuel (gasoline or diesel) as reserve fuel for emergency use; but run their vehicles mostly using CNG, because of the cost advantage of CNG.

CNG is mostly methane (CH<sub>4</sub>). A molecule of methane when burnt generates one molecule of CO<sub>2</sub> and two molecules of H<sub>2</sub>O (water). So using CNG as transportation fuel generates only about a third of CO<sub>2</sub> pollution, compared to that from using liquid fuels. So, after the introduction of CNG as transportation fuel, air pollution in big metropolitan areas like these countries has decreased enormously.

### **CNG AS Transportation Fuel in USA**

Some years ago companies like Honda tried introducing single fuel CNG based vehicles in USA. But as gasoline was quite affordable in those days, Americans who are used to gasoline fueled cars for generations, never showed any interest in those CNG based vehicles. But in the last 6 months when gasoline prices touched \$4/gallon price our psyche seems to have been affected. Even though gas prices have dropped to around \$1.5/gallon, many Americans are not optimistic that gas prices will remain stable at this level for too long. So, public awareness and interest in other cheaper transportation fuels seems very intense at this time.

Unfortunately, instead of looking for CNG as the cheaper transportation fuel alternative for passenger cars, US Auto companies, the Big 3, have invested huge sums of money already in developing electric cars. GM has developed its electric car **Volt**, and has already started constructing a plant to manufacture this car.

In GM's Volt, charging its batteries takes several hours, so essentially it is an overnight operation at home. With a full charge the car gets a driving range of only 40 miles on electricity from the charged batteries. This car also has a regular gasoline tank like other cars today, and if the mileage driven is over the 40 mile range with the charged batteries, the car begins to run on gasoline until it is charged again. When the car is running on gasoline, the gasoline is used to generate electricity which is used to drive the car.

The Volt is rated at 50 MPG, so the 40 mile electric driving range is the same as the driving range obtained by 0.8 gallons of gasoline. A gallon of gasoline has 125,000 BTU, and a KWH of electric power has 3413 BTU. So, 0.8 gallons of

gasoline has the same BTU as 29.3 KWH of electricity. In my home town Ann Arbor, MI, our utility, Detroit Edison, charges 10.2 cents/KWH for domestic customers, so in terms of electricity these BTU cost about \$3, much higher than a gallon of gasoline at today's prices of about \$1.6/gallon.

For comparisons, the NG in residential supply lines has about 1000 BTU/cubic foot, so in terms of BTU content, 0.8 gallons of gasoline is equivalent to 100 cubic feet, which at today's prices costs \$0.82. So Volt's 40 mile driving range with its 50 MPG rating needs 0.8 gallons of gasoline costing \$1.28 at today's prices, and to get the same BTU content from electricity we need 29.3 KWH costing \$3, or 100 cubic feet of NG costing \$0.82.

So Volt owners will find that driving there car on gasoline is cheaper than charging it with electricity. So, even though this Volt, is being promoted as an electric car, there is the possibility that many Americans will not want to buy it; and even if they buy it they may use it as a gasoline car ignoring the electricity charging part.

Also, we do not have electricity generation capacity to support large scale adoption of electric cars at the moment. For these reasons I believe that for now (at least for the next 10 to 20 years) electric cars are not going to save the country much on gasoline consumption.

Even when our electricity generation capacity is augmented (hopefully using nuclear or coal fuel, or solar, or wind), it seems much better to use that extra capacity not for charging large numbers of electric vehicles; but to replace some of the existing CNG fueled generators so as to divert that CNG for transportation use.

We have more abundant NG reserves than the countries using NG as transportation fuel currently, and can crank up NG production by at least a few percent quite quickly, which will support many CNG cars right away. Also, we can get more NG from close friendly countries like Jamaica, and we are beginning to get LNG from Norway.

The drawbacks of using CNG as a 2nd fuel in the vehicle in a passenger car are: (i) loss of some trunk space (about half) for the steel cylinder, and (ii) gas stations have to incur initial investment expenses to begin selling CNG. But with a huge market potential, gas stations will be happy to begin selling CNG if the Big 3 begin promoting CNG as a 2nd fuel in their vehicles. Also customers will not mind the loss of some trunk space due to the cost advantage of CNG as vehicle fuel.

### **My Efforts to GET General Motors (GM) to Investigate CNG as Vehicle Fuel**

I already contacted GM Executives to investigate CNG as vehicle fuel. They agreed and after a brief study, they told me that "the economics is not there for CNG for passenger cars in US". When it is practical and already very popular in some countries, I do not know how GM administrators have reached

the conclusion that “the economics is not there for CNG for passenger cars in US”.

I was surprised to hear that President Bush’s speech, and President-Elect Obama’s statements urged the Big 3 to quickly bring the electric car to the market. I am afraid that this is going to take the country totally in the wrong direction. Even at today’s gasoline prices, using CNG in cars will save customers about 30%. This is a big incentive to sell CNG to customers, in their current mood. And I suspect that gasoline prices may not stay at today’s levels for too long.

With the US Government poised to invest in the Big 3 in a big way, I think the US Government should really force the Big 3 to investigate introducing CNG as a 2nd fuel in vehicles very seriously. If the Big 3 decide to introduce this option, I am sure many gas stations in the country will begin to sell CNG.

I strongly believe that our contry’s energy future in the near term (next 10 to 20 years) is tied to promoting CNG as vehicle fuel, including passenger cars. I have already been exploring with some automobile component manufacturers to design these conversion kits mentioned above according to American standards for the American market, and start manufacturing them in the country. This will help these companies during these lean times when the demand for their current products has gone down so much.

I will also work with these companies to redesign the steel cylinder container of CNG for the car so that the loss of trunk space to accommodate it in the car is minimized.

Promoting CNG as vehicle fuel offers so many benefits for our country that we should work together to make this a reality soon.