

## The Road to Energy independence?

*I would like to preface my remarks by saying, I am no expert. What I have put together here is from research on the net. I feel that we need to develop a holistic plan that takes into account several environmental problems where solutions compliment each other. This is a model. If a different model will accomplish the same thing, fine. I don't think waiting for the market place to decide is going to cut it. For those who may read this, I would appreciate feedback, positive or negative. Tell me where it won't work, but give me references.*

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Biofuels come in many forms, but the two that get the most attention are Biodiesel and Ethanol. There is, however, a better biofuel, a biofuel that does not suffer the drawbacks of either Biodiesel or ethanol. it works with both gasoline and diesel engines. There is no problem with cold starts. There is no competition for food crops. There is an existing infrastructure. In fact it has many advantages over these two biofuels.

### **Biogas - the better Biofuel**

I maintain the best option for, biofuels is Biogas. Honda may have made the smartest move ever by introducing the Civic GX a car that runs on compressed natural gas CNG. What does that have to do with biogas. Well, natural gas is methane and Biogas for the most part is methane. Fuel can be produced for vehicles from human, animal, kitchen and garden waste by composing in an anaerobic process that creates methane. Methane is a green house gas (GHG) that is 20 to 25 times more potent than CO<sub>2</sub>. In other words, we don't want it in the atmosphere. But it makes great clean burning fuel. Not only is methane produced but the by product is a non-petroleum based fertilizer that can be used by farmers.

### **Other countries taking the lead**

Compressed natural gas has taken off around the world as an alternative fuel. In Europe Sweden Denmark and Germany all are moving toward the use of CNG for transportation. . While Honda is making the only CNG vehicle available in the US, Fiat and Volkswagen are planning to come out with a CNG vehicle in Europe. There are over 7 million CNG vehicles world wide.

### **Sweden**

Sweden is having a Fall conference on "The Biogas Highway" this Fall. Sweden has already converted 34 sewage treatment plants to produce biogas. Currently Sweden generate 54% of their gas for CNG vehicles through Anaerobic digestion of their waste. There are some Swedes who feel that generating biogas will lead to elimination of their dependence on

petroleum. The following items show how Sweden has made this transition so successful.

**Co-digestion of Multiple Waste Streams** – Use of co-digestion technology to successfully digest multiple types of organic waste simultaneously is one of the key technological areas in which the Swedish biogas industry is significantly more advanced than the digester technology currently used in the US. Use of multiple feed stocks presents significant opportunities to increase digester output and efficiency and improve the biogas business case. (This could include biomass from clearing for fire suppression.)

**Biogas Distribution Systems** – Multiple possibilities for biogas distribution have been successfully demonstrated in Sweden. These distribution options include dedicated biogas pipelines between biogas plants and biogas refueling stations, injection of “partially cleaned” biogas into “town gas” pipeline networks for residential use, multiple options for over-the-road transportation of compressed biogas, and injection of upgraded biogas into the national NG pipeline network.

**Bi-fuel Vehicles** – Bi-fuel vehicles (vehicles using either compressed natural gas or gasoline as fuel) have limited availability in the US. In Sweden, however, bi-fuel vehicles with no significant compromises in functionality or performance are commercially available and have helped greatly in expanding the market for NGVs to private individuals.

**Transit Buses as “Anchor Customers” for Biogas Plants** – In Sweden, municipal transit bus fleets designed to operate on compressed natural gas (CNG) typically act as the “anchor customers” for new biogas plants. Transit buses are excellent candidates for biogas consumption due to their high fuel usage, fixed routes and centralized refueling facilities." Sweden even runs a train on biogas.

## Germany

"The German gas economy and the automobile industry are geared up for the further development of natural gas fuel infrastructure, with the number of natural gas filling stations set to climb above one thousand, according to Dr. Gerhard Holtmeier, Speaking at the 2008 Automobil International (AMI) he referred to the wide coverage of supply and number of new natural gas vehicle (NGV) models as reasons why discussion on limited availability is now a thing of the past.

He said the advent of renewable biomethane has also contributed to the popularity and expansion of this alternative fuel in Germany, in that biomethane can be used by natural gas vehicles without technical changes to the vehicle because it possesses the same quality as natural gas. Volkswagen indicated natural gas turbo engines could also be employed in models in the future. Representatives of Fiat and OPEL also said they are working on the development of natural gas turbo engines. The OPEL Zafira CNG turbo is expected to be available at the beginning of 2009."

## Argentina

Argentina has over a million NGVs and is converting 9000 vehicles a month. They have more than 1020 CNG fueling stations.

## **United States**

Natural gas vehicles NGVs are nothing new to the U.S. Companies with fleets of trucks, governments some public transportation are now running on natural gas. There is an existing fuel station infrastructure throughout the U.S.

One of the real pluses to natural gas is that it does not have to be delivered by truck if the fueling station is within range of a natural gas pipeline. This reduces the need to "deliver" the gas. This also makes it possible to fuel up at home with. A home appliance, known as Phill, which is sold by Honda can be installed where you park your car over night.

Other advantages to the use of natural gas is that is cheaper, burns cleaner. increased the life of the engine, and reduces the amount of oil changes.

## **T. Boone Pickens**

Installation of renewable Solar and Wind installations is growing rapidly, but Biogas could be much bigger. It is the elephant in the room that few people in the US are talking about. Yet!!!

Billionaire, T. Boone Pickens, is investing 10 billion dollars in a huge wind farm which will feature 2,700 wind turbines generating 4,000 megawatts. The equivalent of 2 nuclear power plants.

Pickens' wind farm is part of a wider vision for replacing natural gas — primarily an electric power-generation fuel now --with wind and solar for power generation, to free up more clean-burning natural gas — to power automobiles instead.

Pickens states that shifting natural gas used in power generation to transportation needs could cut U.S. crude oil imports by nearly 40 percent.

In fact Pickens has started another company, Clean Energy, that is installing a CNG fueling stations where there is a market for CNG.

## **Energy independence for California?**

What if California were to start a statewide program to use all our organic wastes to generate clean burning Biomethane. If each county were to build an anaerobic digester plant at the transfer station or land fill and every waste water treatment plant and negotiate a contracts with energy providers to purchase the methane to be injected into the natural gas grid? What if the State decided that all new state vehicles be required to run on CNG or electricity?

## **20 Reason for California to Embrace the CNG/Biogas Economy**

**1 CNG is cheaper than gasoline.**

This is true. CNG is 30% cheaper than gasoline per Gas Gallon Equivalent (GGE). As the gasoline prices go up, CNG prices go up SLOWER. Creating our own methane will keep CNG prices down.

**2 CNG is “renewable”.**

As described above, we can create our own source of methane through anaerobic digestion to run our vehicles.

**3. CNG is the cleanest burning fuel for vehicles.**

The Honda Civic GX CNG vehicle is the cleanest car on the road.

**4 The Infrastructure for Natural Gas already exists.**

It is all around us. PG&E has a fueling stations throughout their territory. Honda will provide a booklet showing where to find CNG fueling stations are in California. Many converted diesel trucks are using CNG. The cleanest burning buses in the country are the CNG buses in Sacramento. As demand for CNG increases, it will be easy to expand the supply grid.

**5 CNG is a proven technology.**

No breakthroughs needed. CNG vehicles have been on the road for years in this country. They have an excellent safety record

**6. CNG will extend the life of the engine**

CNG has a more efficient combustion than liquid fuels, does not allow sediment formation, keeps spark plugs clean, and lubrication is better and more effective as it does not wash the cylinder walls of the engine. The lubricant lasts longer and performs better allowing longer intervals between each oil change. CNG also has a larger octane number than gasoline, so it does not produce self-ignition.

**7 CNG vehicles can be refilled at home**

A “home appliance” called Phill can be installed where you park your CNG vehicle overnight. You can start every day with a full tank of gas.

**8 CNG vehicles are quieter**

Next time your in Sacramento seek out one of the CNG busses to see how much quieter they are than diesels. Some communities are REQUIRING that their waste management vehicles run on CNG. This would probably make the people living around the Transfer Station very happy.

**9. The byproduct in the anaerobic process is fertilizer.**

Once the methane is extracted from the waste feed, What is left can be used as fertilizer and it replaces petroleum based fertilizers

**10 Save County costs**

The Counties won't have to pay to have our organic waste trucked to a landfill.

**11 Will keep our organic waste out of the landfill**

Finding places to bury our garbage is getting more difficult. It is becoming necessary to truck wastes further away from our communities. When it is buried, the anaerobic process begins and Methane is released to the atmosphere, something we don't want. Methane is a Green House Gas that is 20 to 25 times more potent than CO2.

**12 Thus, we reduce GHG production.**

**13 Create green jobs**

We will need people to build and run these anaerobic digesters.  
We may want to create some additional fueling stations.

**14 Creates a decentralized source of renewable energy**

With the Cooperation of the energy companies we could have Digesters throughout the California that could produce Biogas for the grid

**15 Utilize waste from the fire suppression clearing program**

Green waste. needles, leaves and small branches and shrubs can be part of the mix of organic material used to produce Biogas.

**16 New Refueling stations could tie into the Natural Gas Grid**

Unless the fueling station is remote, Trucks will no longer be needed to deliver the fuel, thereby reducing fuel consumption for these deliveries

**17 Potential business to convert existing vehicles to bifuel CNG/gasoline**

Unfortunately Honda only sent 1000 CNG vehicle to the states for 2008. They are all sold for this year. With the Tax incentive of \$4,000 federal and \$3,000 State, they went fast (sticker price was \$25,000). Rather than expect everyone to buy a new CNG vehicle we should attempt to make conversions of existing vehicles, thereby not sending good vehicles prematurely to the wrecking yard and wasting all the embedded energy that went into making them. Since conversions can be made bifuel (CNG/gasoline), This will help ease the transition to new CNG vehicles. If the State adopted a CNG policy, I'll bet other car manufacturers would soon produce CNG vehicles.

**18 Provides a transition to the hydrogen economy**

When the Fuel Cell vehicle is finally available, it very likely be more expensive than the typical new car but if a car is fitted for CNG it can be converted to a hydrogen burning vehicle until fuel cell vehicles are affordable.

**19 Sustainable**

As the population increases, more waste will be produced.  
Hence more fuel can be produced. In other words it is sustainable.

**20 We would be creating the cleanest fuel next to Hydrogen**

This means our air will be cleaner.

## **A Holistic approach**

In conclusion, going to a CNG economy is the most sensible way to meet the challenge of high gasoline prices, air quality and our mounting waste disposal problems.

Currently Biogas generating plans are combined with electric generators, to produce electricity. Doing so wastes over 50% of the energy from the gas. Biogas plants will be far less expensive to build than a biogas/electrical generating plant and will have less environmental hoops to jump through to pass government rules and regulations. Since Sweden is further advanced in the science of anaerobic digestion I would suggest hiring one of the Swedish firms as consultant to carry out this program.

Injecting the gas generated into the natural gas grid is the most sensible approach. PG&E has already contracted with a dairy farm in the Central Valley to buy Biogas generated methane,  
why not from the rest of us.

Of course, this plan will take a lot of inter-agency planning. Let us set a goal and move forward.

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