



# **The environmental benefits of CNG and biomethane – reasons for energy agencies and policymakers to deal with this issue**

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4<sup>th</sup> February 2010  
Madagascar Final Conference, Prague

# CNG and Biomethane

- CNG is Compressed Natural Gas
  - Natural Gas is a fossil fuel, methane
  - It is compressed only for storage reasons, usually to 200 bar pressure
  - It is used at atmospheric pressures
  - It took millions of years to make, billions of years ago and is one of the most abundant and widely distributed fossil fuels on the planet

# CNG and Biomethane

- Biomethane
  - Biomethane is very similar to natural gas in chemical composition
  - **But it is very much better:**
  - Instead of taking millions of years to make, billions of years ago, it can now be made in about 18 days from organic materials such as waste food
  - Less than half of all the food grown in the world is actually eaten!
  - This is not just because people waste food, but one cannot eat the residue which includes all the inedible leaves, stalks, skins, roots and peelings and this means that more than half of all the food crops grown is available as a renewable resource
  - Capturing the methane, given off as these discarded food wastes decay, which would otherwise become a damaging greenhouse gas some 23 times worse than carbon dioxide, and using it as a transport fuel offers better climate damage mitigation than any other technology

# Renewable Energy

- The reason for using renewable sources of energy is to reduce the use of finite fossil fuels
- There are two main reasons for wanting to reduce using fossil fuels as a source of energy:
  - Because using fossil fuels releases carbon dioxide into the atmosphere
  - Because fossil fuels are a finite resource which is unsustainable in our lifetime

# Renewable Energy

- The carbon in fossil fuels was taken out of the atmosphere millions of years ago by plant life and locked up in coal, oil, and gas, from an era when there was almost no oxygen and the majority of the earth's atmosphere was carbon dioxide

# Renewable Energy

- At the beginning of this process the earth's atmosphere consisted of about 97% CO<sub>2</sub> and no oxygen
- Plant life developed and, using photosynthesis, took in this CO<sub>2</sub>, used the carbon for structure, and expelled the oxygen
- This process continued for thousands of billions of years until the atmosphere changed from about 97% CO<sub>2</sub> and no oxygen to about 0.3% CO<sub>2</sub> and about 21% oxygen

# Renewable Energy

- The carbon from the anaerobic atmosphere was locked up in the plant life which continuously became buried to form the fossil fuels coal and oil and gas
- New aerobic life evolved which relied on the oxygen in the atmosphere and the oxygen which was dissolved in the water

# Non Renewable Energy

- Then man came along and started digging up this fossil fuel carbon and burning it
- Using the oxygen from the atmosphere to burn the carbon and then throwing it back into the atmosphere as CO<sub>2</sub>
- And some people wonder why this should cause a problem?
- !!!!!!!

# Environmental Advantages of Biomethane

- Why is biomethane so good as a fuel?
  - That half of the food which is not eaten is thrown away
  - It rots down and releases methane into the atmosphere
  - Methane is a greenhouse gas about 23 times worse than CO<sub>2</sub> and is a major contributor to climate change
  - Preventing this release of methane from rotting food wastes, and using it as a fuel, is actually doing good for the environment
  - This gives a whole new meaning to the expression 'climate change'
  - If all the methane could be captured we would significantly alter the greenhouse gas escalation and climate change trend
  - Hence capturing any amount of methane is good for the environment

# Environmental Advantages

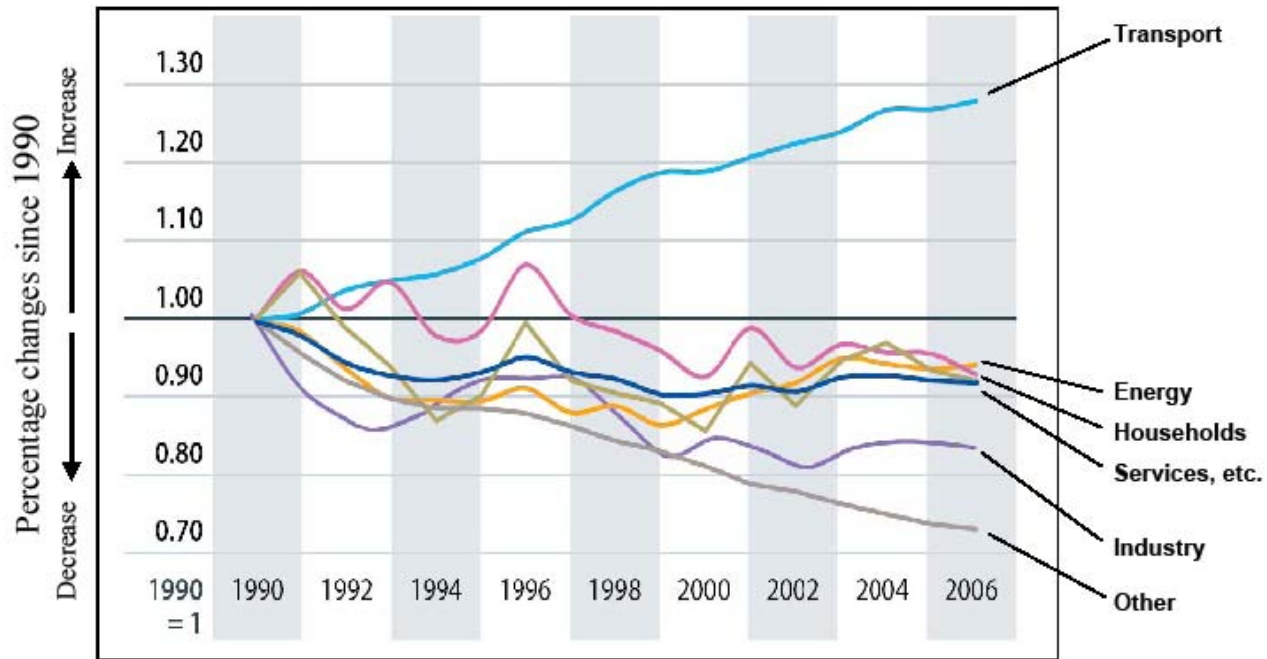
- Biomethane as a transport fuel
  - Biomethane is better than all the other alternative fuels such as biodiesel, bioethanol, wind power, solar energy, tidal and wave power, electricity, or even hydrogen
  - Because:
    - All these ‘alternative’ fuels merely reduce climate damage by being ‘less bad’ than fossil fuels, rather than actually ‘improving’ the environment as does using biomethane

# Renewable Energy and Transport

- Thanks to the change from coal to natural gas and man's efforts to reduce emissions of carbon dioxide, greenhouse gases are generally reducing
  - emissions from industry, domestic use and services are falling
- **EXCEPT** those emissions from the transport sector:
  - emissions from this sector are increasing at a much greater rate than those from the other sectors
  - they amount to over a quarter of all the greenhouse gases
  - they are rising alarmingly

# Why Renewable Energy in Transport

## Trends in greenhouse gas emissions from EU-27 by sector



Sourced by Organic Power using data from "EU Energy and Transport" publication by the European Environment Agency  
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Saved at 15:17hrs on 08 Jul 2009, printed at 15:08hrs on 09 July 2009

# Renewable Energy in Transport

- Despite this appalling situation with respect to emissions from transport, some governments around the world are still encouraging the use of biomethane to make electricity
- Vehicles can be run on various fuels, but capturing the methane and using this as a vehicle fuel has an enormously beneficial effect on the environment
- None of the other 'alternative' fuels have a beneficial effect on the environment
- They are just 'less bad'
- Using biomethane is actually doing 'good'
- Hence it is the best renewable energy
- This is just one reason why biomethane should be promoted

# Why should Energy Agencies and Policymakers promote natural gas and biomethane?

- That was the title I was given, but the easier question to answer is:

“Why wouldn’t they?”

- Only if they are ignorant or if they have another agenda
- We have been surprised at the prevalence of both the foregoing reasons
- There are still people in the world, in responsible positions, who are amazed that you can run vehicles using gas as a fuel
- There are a great number of people who would rather use liquid fuels than gaseous fuels because some of them have trillions of dollars tied up in the refining and distribution of liquid fuels

# Reasons for using natural gas and biomethane:

- Less CO<sub>2</sub> is released when the energy from methane is released
  - This is a fact, due to the basic molecular structure of the fuels
  - Methane is CH<sub>4</sub>      One molecule of C for 4 molecules of H
  - Petrol is C<sub>8</sub>H<sub>18</sub>      Eight molecules of C for 18 molecules of H
  - Diesel is C<sub>12</sub>H<sub>23</sub>      Twelve molecules of C for 23 molecules of H
  - Carbon is the pollutant which makes CO<sub>2</sub>
  - Methane has to produce less CO<sub>2</sub> than any other hydrocarbon fuel
  - Biomethane simply releases the CO<sub>2</sub> back into the air from whence it was taken by the organic matter during its growth. Hence sustainable

# Reasons for using natural gas and biomethane:

- Less Particulates
  - Not just the sooty particulates you can see coming out of the exhaust pipes of petrol and diesel cars
  - These are above 10 microns in size
  - But also the PM 5 and PM 2.5 particulates which you cannot see and which are not filtered out by the hairs in your nose
  - Which end up in your lungs and never, ever, come out
  - Which lead to asthma and breathing problems
  - Causing premature deaths and millions of \$\$\$ in health care

# Reasons for using natural gas and biomethane:

- Less Carbon Monoxide
  - Usually 90% reduction if a vehicle is using natural gas or biomethane
  - Carbon monoxide is the gas which kills people when they put a pipe from the exhaust into their cars
  - Carbon monoxide is the same gas which kills people in houses when the central heating boiler has not been serviced properly

# Reasons for using natural gas and biomethane:

- Pollution effects of natural gas and biomethane
  - No smell
  - Not poisonous
  - Not carcinogenic
  - Not harmful to human health

# Reasons for using biomethane:

- Sustainable effects of biomethane
  - Natural, renewable and sustainable if made from food “wastes”
  - Not restricted to specific areas
  - Biomethane can be available everywhere there is human life on the planet
  - The manufacture of biomethane, using anaerobic digestion, creates clean, organic, soil conditioners and fertilisers
  - Using these makes the production of crops sustainable and reduces (should eliminate) the use of fossil based chemical fertilisers
  - The crops also require significantly less water

# Reasons for using natural gas and biomethane:

- Summary
  - To reduce air pollution generally
  - To reduce vehicle traffic noise considerably
  - To improve urban air quality particularly
  - To deal with their organic wastes sustainably
  - To provide security of supply indefinitely
  - To reverse the global warming effect of using fuels
  - To create local employment
  - To produce organic soil improvers and fertilisers

# Why should Energy Agencies and Policymakers promote natural gas and biomethane?

- Because they can see the overall picture
- Governments are divided into autonomous Departments:
  - Department for Transport
  - Department for Environment
  - Department for Health
  - Department for Justice
  - Department for Employment
  - Department for Tourism
  - Department for Defence

# Why should Energy Agencies and Policy Makers promote natural gas and biomethane?

- Because Governments are divided into these autonomous departments they cannot always see the overall benefits in so many different areas
- Worse is that often, if they can see an advantage to another Department, they see this as a valid excuse for passing the responsibility for implementation to that other department
- I am sorry to report that was very obviously what was happening between Czech government departments in this very conference room yesterday

# Why should Energy Agencies and Policy Makers promote natural gas and biomethane?

- The problems of Climate Change, Air Quality, The Environment, Human Health, etc are all LONG TERM problems
- They need long term, stable and consistent policies to bring about solutions
- Governments, in general, are not long term, nor stable, nor do they have consistent policies
- This is why our Energy Agencies and Policymakers are the people to promote natural gas and biomethane

# Why should Energy Agencies and Policymakers promote natural gas and biomethane?

- Because the Energy Agencies and Policymakers are not ignorant of the true facts, and they do not have vested commercial interests to support
- Because they understand that natural gas and biomethane are the best fuels available



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