

Bio-Methane - bundle of benefits

Most car manufacturers in the world do offer cars with **bi-fuel engine** that can run on methane as well as petroleum and come with two fuel tanks, providing for freedom in use. Vehicles with so called dual-fuel engines run on a blend of methane and diesel, predominantly on methane (85-95%).

Example of benefit calculation

Assumptions:

Bi-fuel car (methane/petroleum) in usage: 15 years

Travel distance / year : 16.000 km on methane.

Fuel usage /100 km: 10 Nm³ or 10 L petroleum.

Fuel savings: 0,556 € / L if bio-methane is used.

Price of bi-fuel car = petroleum car.

I. Fuel cost benefits

Nominal savings in fuel cost / car: 13.333 € (EUR)

Given 180 kr /EUR, then savings = 2.400.000 kr

II. Environmental benefits

Less greenhouse gases released due to less burning of petroleum (24.000 liters): 55,8 Tkg of CO₂ equivalency (eq.). Due to the source for Bio-Methane the net savings of greenhouse gas emission (air pollutants) is close to this number.

III. Macroeconomic benefits

Foreign currency savings in Iceland: ~10.000 €/car

There off due to Icelandic Bio-Methane* : ~8.200 €

There off due to CO₂-eq. savings** : ~1.800 €

* Given that 30% of retail price for petroleum is a cost in foreign currency. ** Given CO₂-eq. savings = 33 € /Tkg

Savings in foreign currency of ~10.000 €/car will increase economic prosperity in the country. There are currently ~250.000 vehicles in Iceland.

In short:

- The consumer will benefit
- The environment will benefit
- The society will benefit
- Future generations will benefit

Bio-Methane - a huge potential in Iceland

Metan Ltd. was founded in 1999 with the main purpose of increasing supply and demand for environmental friendly fuel in form of Icelandic methane. During the first decade the marketing mix was gradually improved and in 2007 a first class service station for methane was opened to the public in Reykjavík in corporation with N1 Ltd., the largest multi-fuel service company in the country, and another smaller service station opened in Hafnarfjörður, a nearby municipality to the capital city.

The success so far underlines innovative corporation between Metan Ltd, SORPA , N1 Ltd , OR and REI and brings to light the great value invested in the knowledge and expertise at SORPA . Today, Icelanders can already substitute fossil fuels for an environmental friendly bio-methane of highest quality, up to 98% purity. And at the same time, enjoy considerable price savings while contributing to foreign currency savings as well as job opportunities and innovation in the country.



Iceland has a real opportunity today in becoming increasingly self sufficient in supply of vehicle fuel by producing bio-methane. By no means are the raw material sources limited to the current usage in the world and scientific and technical developments are constantly delivering new opportunities in raw material selection, raw material processing, digestion, upgrading and infra-structure distribution. The future will include usage of ocean bio-mass (algae), energy crops (fast growing plants), improved digestion process control and liquefied bio-methane (LBG). Potential bio-methane production in Iceland can easily fulfil foreseeable demand for transportation fuel in the country, and support total energy sustainability in Iceland.

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Bio-Methane - environmental and economical bundle of benefits



The message is loud and clear.
Bio-Methane brings prosperity



Social responsibility & economic benefits

- Bio-Methane is produced in Iceland
- Domestic production saves foreign currency usage
- Bio-Methane is an environmental friendly fuel
- Usage of Bio-Methane supports innovation in Iceland
- Usage of Bio-Methane creates jobs in Iceland
- Bio-Methane usage increases sustainability
- Bio-Methane production from energy crops creates highest fuel yields/ha of land compared to other bio-fuels .
- Bio-Methane production opens new options in agriculture
- Bio-Methane increases energy security in Iceland
- Most car manufacturers in the world offer vehicles with **bi-fuel** engine that can run on methane as well as petroleum.



Björn Halldórsson, CEO Metan Ltd, Gunnlaugur Þráinsson, CMO N1 Ltd. and Finnþógi Eyjólfsson, specialist Hekla Ltd.

Benefits of choosing a Bi-Fuel car :

- Methane fuel ensures considerable fuel cost savings.
- Bi-fuel car is cost effective.
- Bi-fuel car is priced similar or lower than a petroleum car.
- Supply of bi-fuel cars increases constantly.
- Free parking in Reykjavík.
- Same comfort in driving.
- Less danger of accidental fire.
- Methane is harmless when inhaled or touched.
- Methane fuel is harmless to cargo.
- Methane fuel burns clean, prolonging engine lifespan
- Re-filling time for methane fuel is very similar to petroleum.
- If methane is not available the car can run on petroleum.
- Number of service stations for methane increase at rising speed all over the world and will in Iceland too.

SORPA's pilot operation - cost effective

As a proactive response to environmental concerns over greenhouse gases emission from the landfill in Álfsnes, SOPRA developed a pilot operation in collecting landfill gas (biogas). Due to the unique utilization in Iceland of geothermal water for district heating and self sufficient hydro-electric supply of electricity, the greatest social, economical and environmental benefits of using biogas in Iceland is to produce fuel replacing imported fossil fuel. SOPRA's pilot operation has been a remarkable success and is of great value to the Icelandic society.



Organic waste from household is just one of many sources available for biogas and bio-methane production.

As a response to EU landfill regulation, municipalities in the capital area have agreed on a waste management plan which includes building a digester for biogas production. A digester brings new opportunities.

- Enhances the efficiency of biogas production
- Increases the volume of bio-methane produced.
- Returns a by-product, a soil enhancer rich in nutrient
- Soil enhancer can be used to re-vegetate land
- Re-vegetate land closes the loop - sustainability
- Possible raw materials for bio-methane production
 1. Wastewater
 2. All biological raw material from industries
 3. Agricultural waste
 4. Energy crops
 5. Algae .
 6. And more

SORPA's upgrading plant - energy efficient

The biogas is collected from the landfill and brought, with a piping system, directly from the site to the upgrading plant and treated with so called Water Scrubber Technology, an energy efficient way of upgrading biogas to bio-methane fuel. The outcome is an environmental friendly vehicle fuel of highest quality, up to 98% purity. From the upgrading plant the bio-methane is transported through a 10km long pipeline directly to customers at the N1 service station in Reykjavík.



Economic challenges all over the world have brought increasing attention to sustainability and better understanding of the greater good that usage of bio-methane can bring. The biogas society all over the world has gradually managed to deliver the message. By no mean should the Cinderella story in the fuel exchange history be ignored or oppressed. It is time to open the doors for bio-methane to the bigger platform and enjoy the beauty and the energy it brings. Countries all over the world have great opportunities.

Capital area municipalities are the owners of SOPRA. SOPRA owns and operates the upgrading facility.

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