

Bioenergy 2009

Biomethane – a premium fuel for CHP, for vehicles and for heating

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Agenda

- CNG Services Ltd
- Aims for the presentation
 - What is biomethane and how is it made?
 - CHP
 - Biomethane injection into the gas grid (BtG)
 - Biomethane fuelled vehicles
 - Conclusions

CHP is good if all the waste heat can be used
Vehicle use and Biomethane to Grid go together

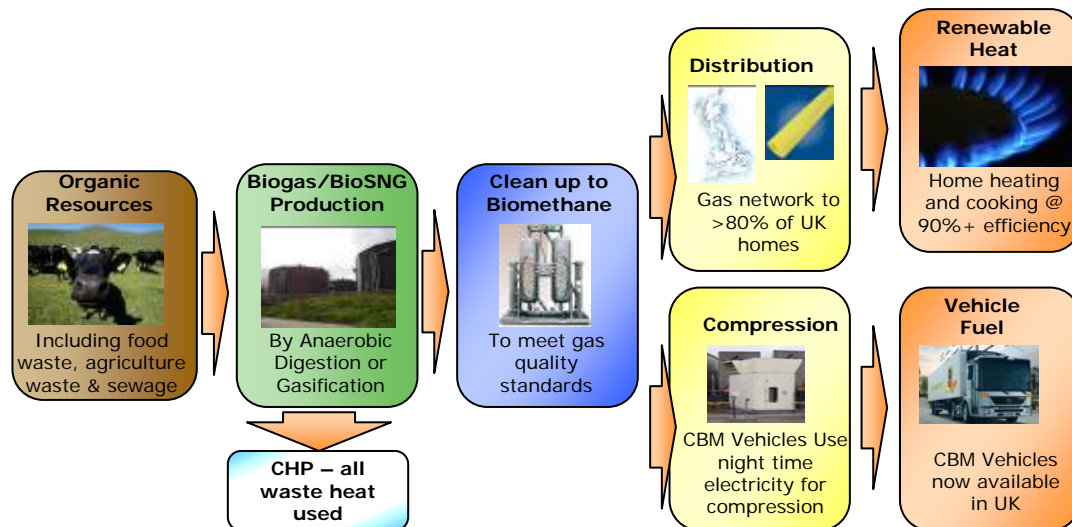
CNG Services Ltd

- Supporting development of the BtG opportunity in the UK:
 - Cleaning bio-gas and injecting biomethane into the gas grid
 - Creator of the UU Davyhulme BtG and CBM Project
 - Supporting a further 15 potential BtG Projects in the UK for Water Companies and AD developers
 - Supporting introduction of biomethane fuelled vehicles in the UK
 - VW Caddy Ecofuel
 - MB Sprinter NGT and Econic NGT
 - Iveco Daily and Eurocargo

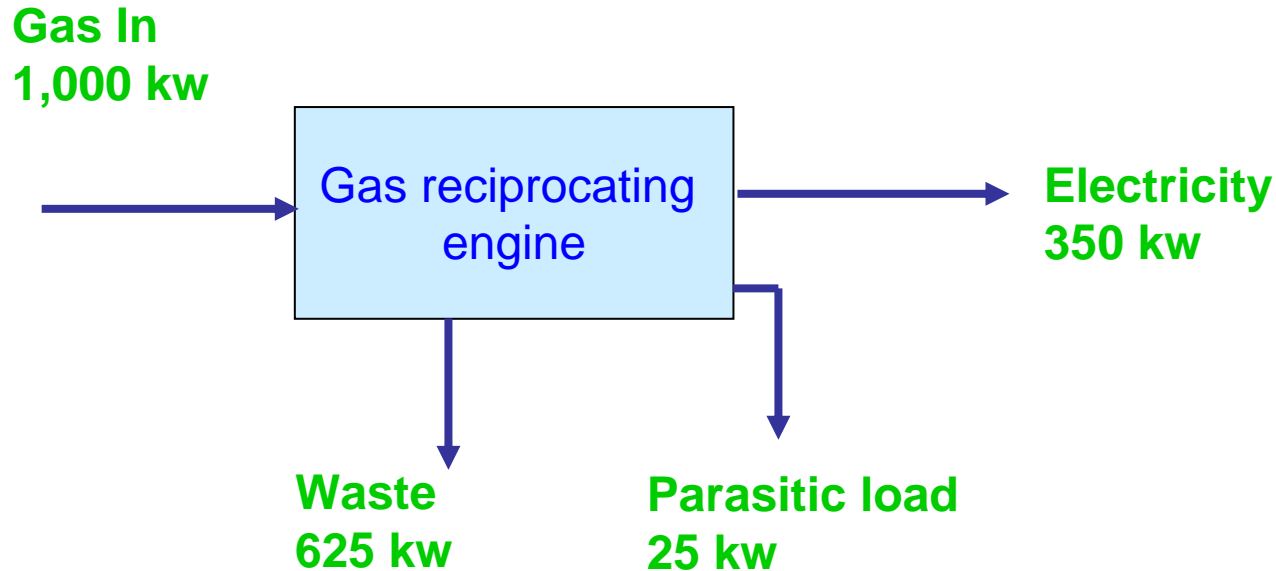
We are independent from all makers of CHP plant, vehicles, clean-up, compression etc. Our aim is to support biogas producers in exploiting the biomethane to grid and biomethane as vehicle fuel opportunities

What is biomethane?

- Bio-gas contains typically 65% methane, 35% CO₂
 - Lager shandy
- Natural gas contains around 90% methane, with ethane, propane, butane, CO₂ and nitrogen making up the rest
 - Blended whisky - made from dinosaur poo in a prehistoric AD, contaminated over the millenia
- Biomethane is bio-gas without the CO₂, containing around 98% methane
 - Malt whisky, the elixir of life, we all want to drink it



Local electricity generation efficiency

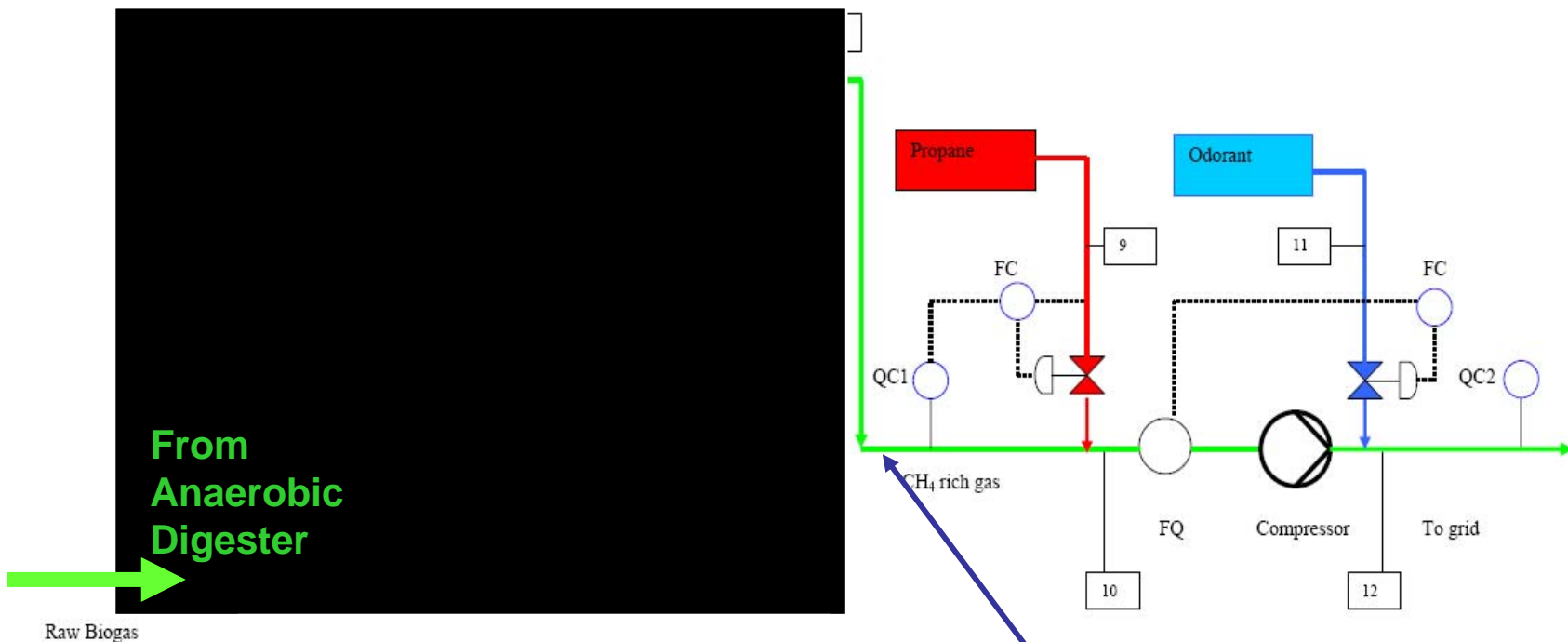


Electrical efficiency (Gross) = 35.0%

Overall efficiency (Gross) = 35.0%

Electricity generation from a gas engine with no use for waste heat means that around 65% of the energy contained in the natural gas is wasted

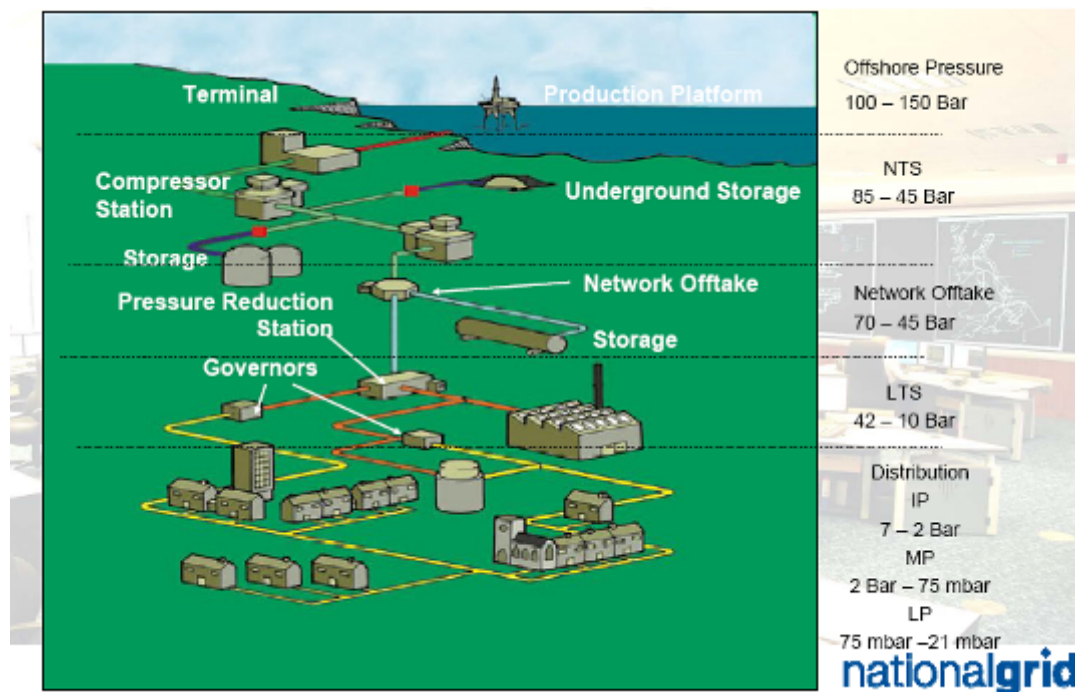
Bio-gas to biomethane to grid and to compressed biomethane vehicle fuel



Lots of ways of doing this, all can be delivered in a 'black box'

Or can go direct to CNG compressor and vehicles from here

Biomethane to Grid (BtG)



Widespread consensus that gas grid injection is attractive because of absence of uses for waste heat where renewable methane is made. Take the gas to the customers along existing pipelines and have high efficiency utilisation....no need to move biomass by road...

Potential

- Germany has over 3,700 agricultural scale biogas plants
- The Biogas industry employs around 10,000 people
- The industry is worth about 1 Billion Euro / yr to the German economy
- BtG growing fast
 - Target of 10% of all German gas by 2020

BioEnergiepark near Güstrow

In this BioEnergiepark, 10,000 m³ of biogas will soon be produced, upgraded to natural gas quality and fed into the natural gas grid per hour. This equals an installed electrical connected wattage of 22 MW_e per hour. The total plant consists of five modules which produce 2,000 m³ biogas per hour each. That corresponds to a capacity of around 4.4 MW_e for every module.



A total of five modules produce 10,000 m³ biogas.

Enough renewable methane gas to supply 50,000 new homes.....

UK Energy Act

- At present, biogas is rewarded when used to make electricity and when used as a vehicle fuel
- Energy Act 2008 incentivised BtG
- Consultation to follow in Q4 2009 to establish level of tariff
- Financial premium for gas injected to the gas grid likely to be in the range 120 – 200 p/therm
 - The smaller number is broadly equivalent to double ROCs for a large AD
 - The larger number reflects benefit from higher efficiency use as renewable heat (see next slide)
 - Premium needs to incentivise the right market behaviour as we cannot afford to pour malt whisky down the drain....
- Premium will be paid from April 2011

We are asking DECC to support BtG and biomethane as vehicle fuel because it gives around DOUBLE the replacement of fossil fuel compared to electricity generation

Use of Renewable Methane

Generate electricity,
some use for Waste heat

Around 50% of the energy in the renewable methane is wasted

Run vehicles in dual fuel diesel-biomethane or dedicated engine

100% utilisation and 90% plus CO₂ savings

Inject to gas grid, displace fossil methane in heating

100% as energy used to make biomethane is similar to energy used to transport gas to UK by pipeline (less than for LNG)

Energy used –
displacing fossil
fuel

Energy wasted –
not displacing of
Fossil fuel

50%

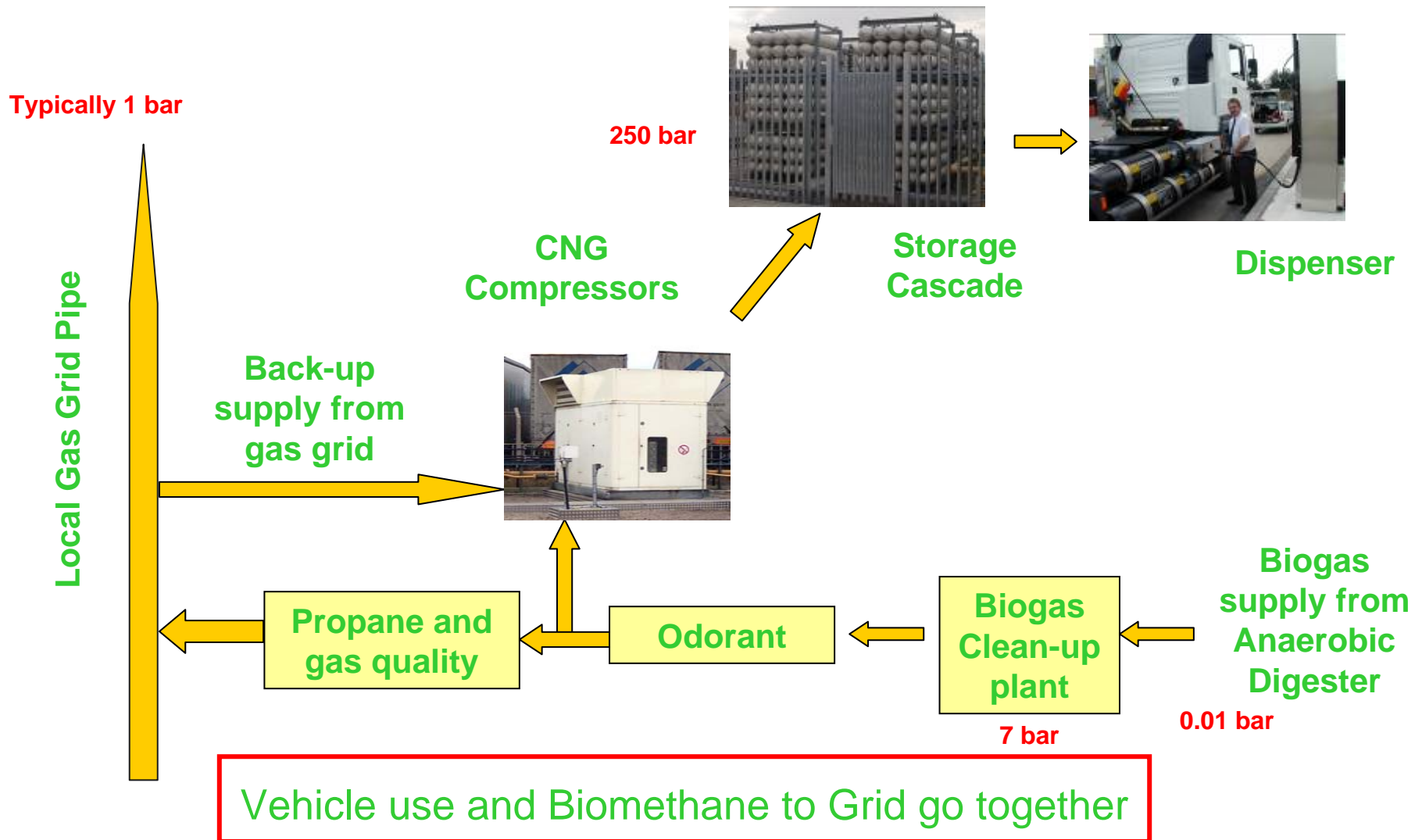
50%

100%

100%

Given the need to displace 15% of fossil fuels by renewable fuels by 2020, the transport and heating uses for biomethane are twice as good as the electricity use

Compressed biomethane vehicle fuel



What about efficient utilisation of the biomethane?

Key point is that biomethane is
malt whisky, it should not be
wasted

Efficient appliances - Baxi Ecogen



Electrical power:	1 kWe
Thermal power:	3 - 24 kWth
Total efficiency:	> 90%
Dimensions:	950h x 450w x 420d(mm)
Noise:	45 dB(A)
Weight:	110kg

What a great idea....take waste, make into biogas, clean-up, inject biomethane into existing gas grid, refurbish a home and install one of these – you can't beat that....equivalent to licking the whisky glass....and they are made in Preston...

Efficient appliances – Ceres fuel cell CHP

CeresPower 



Compact, wall mounted unit

High efficiency integrated system

- Heating at highest 'SEDBUK A' efficiency
- Electricity at higher efficiency than engine based CHP
- Can generate power all year (even outside heating season)
- Working with British Gas

Very high efficiency, also made in UK

Efficient cars - Passat TSI EcoFuel

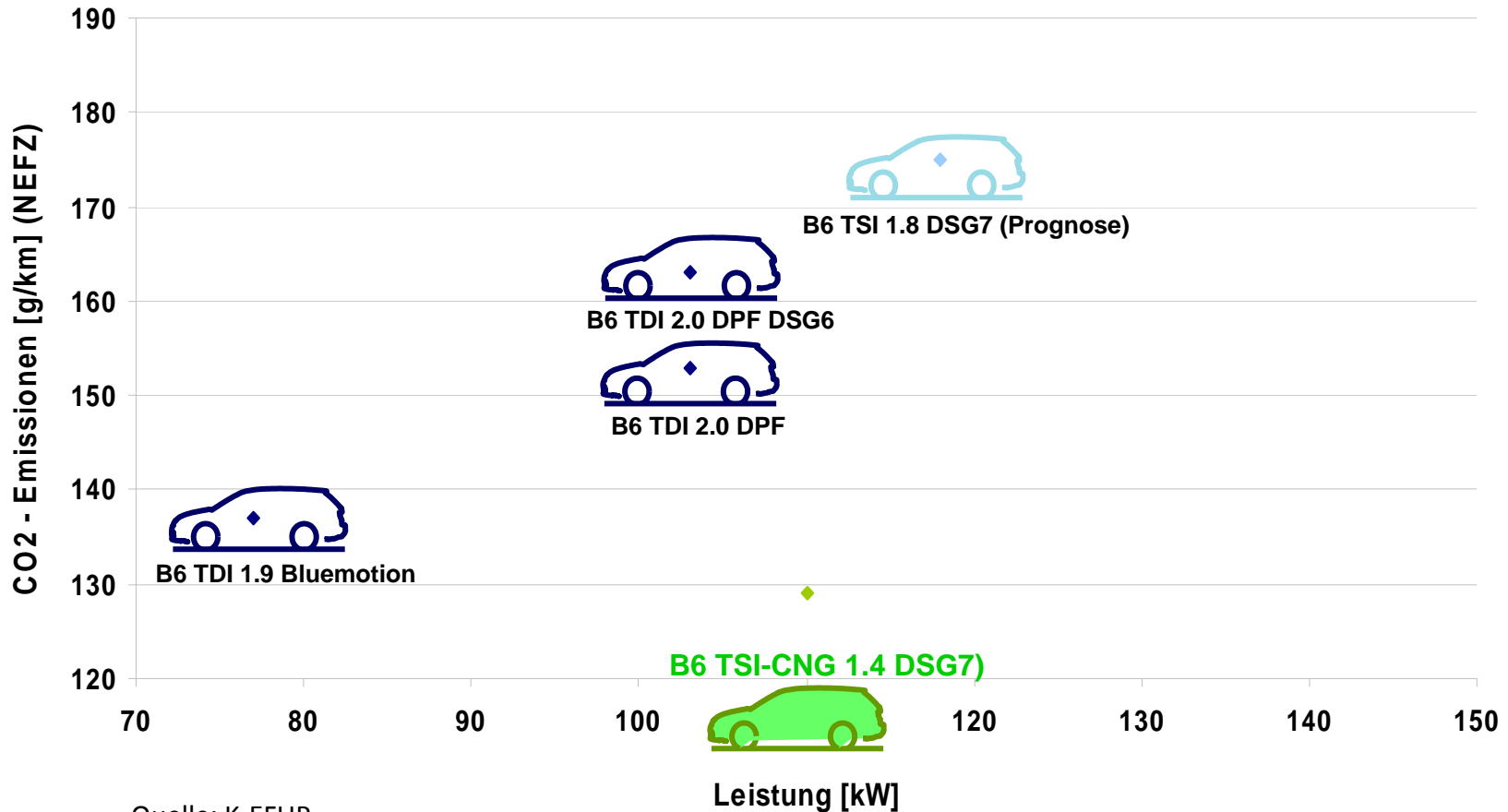
- engine 1.4 TSI CNG
already fulfills Euro-5
- operating mode: bivalent
- performance 110 kW / 150 PS
0 – 60 mph in 9.5 seconds
- torque 220 Nm (1.500 – 4.000 U/min)
- maximum speed 210 km/h
- fuel consumption 5.1 kg / 100 km
- CO2-emissions **119 g/km**
- Range CNG/biomethane **420 km**
3-underfloor gas tanks, steel
135 Liter (22 kg)
gasoline **400 km**, 31 Liter



820 km total operating range – Electric
Vehicles have a **target** to aim for now

CO2 emissions

VW Passat - different engine/fuel options



Quelle: K-EFUP

On biomethane = carbon neutral



Efficient cars - Passat TSI EcoFuel

VW Passat 1.4 TSI EcoFuel Trendline

Viertürige Stufenhecklimousine der
Mittelklasse (110 kW / 150 PS)

Nun ist es soweit: der Passat TSI EcoFuel erreicht als erstes Auto die vollen fünf Sterne beim ADAC EcoTest. Das Erdgas-Auto bietet sehr geringe Schadstoffemissionen und zusätzlich einen geringen CO₂-Ausstoß. Der Erdgasverbrauch fällt mit durchschnittlich 4,9 kg recht günstig für eine große Limousine aus. Die Reichweite ist mit etwa 425 km durchaus praxistauglich. Geht das Gas mal aus (21 kg Tanks), kann auch mit dem 31 l Benzintank weitergefahren werden. Vom Gasantrieb bekommt der Kunde kaum etwas mit, in beiden Betriebsarten beschleunigt der kleine 1,4-l-TSI-Motor mit Kompressor und Turbo den Passat flott, die Tanks verbergen sich unter Kofferraumboden und Rücksitzbank. Der große Kofferraum bleibt also bestehen. Das umweltfreundliche Angebot startet bei knapp 30.000 Euro - dafür bekommt man ein absolut praxistaugliches und ungewohnt flottes Erdgasauto.

Karosserievarianten: Limousine und Kombi **Konkurrenten:** mit Erdgas keine

+ erstes 5-Sterne-Auto im ADAC EcoTest, sehr gute Verarbeitung, sehr großer Kofferraum, viel Platz im Innenraum, funktionelle Bedienung, bequeme, körpergerechte Sitze, sichere Straßenlage, starker, sehr lauffruhiger Motor, niedriger Verbrauch, günstig im Unterhalt

- hinten schlechte Sicht



ADAC-URTEIL



Stand: April 2009
Text: M. Kührer

The Passat Ecofuel is the first and **only** car on the European market to achieve 5 stars in the ADAC-Eco-Test - better than a Toyota Prius. EVs have to aim to be as good in CO₂ and practicality terms

VW Caddy Eco-fuel

- Best selling CNG van in Germany, launched mid 2006
 - Built to run on CNG rather than a petrol conversion
 - Right hand drive is type approved for sale in UK
 - Also available at Caddy Maxi Car – 7 seats
 - We are working with a number of companies who make home refuelling devices that can fill with CNG overnight
 - Good financial savings, good eco outcome



EEV emissions – very low NOX and particulates.
Carbon neutral on biomethane – this will become
the van that Water Companies want to have

MB Sprinter NGT

- Mercedes Benz
 - Sprinter CNG in UK in Q2 2009
 - First time MB have designed a CNG Sprinter from 'first principles' (rather than petrol conversion):
 - Very low emissions
 - 25% less CO2 than petrol on grid gas
 - Carbon neutral on bio-methane
 - Also has petrol tank
 - Total range of 1100 km
 - Ideal for supermarket home delivery, quiet, clean, long range, fast refuelling



No London Congestion Charge
Carbon neutral on biomethane – the big white
van for Water Companies and home delivery

MB Econic - tractor

- Distribution logistics
 - EEV emissions and 20% lower CO2 than diesel
 - Drive at night into cities as very quiet
 - On bio-methane, carbon neutral
- MB bringing to UK in right hand drive form
 - In UK in Q3 2009
- What a great idea for supermarkets



Ideal for inner city deliveries
and loads of <36 tonne
This truck loves biomethane

Biomethane conclusions

- We have the organic resources and the political vision to develop anaerobic digesters
- We have a landfill problem and the need to recycle waste
- Biogas should only generate electricity when all the heat can be used
- We have the gas grid and the full support of UK gas distribution network owners and energy suppliers
- UK gas production is declining and we need to find new gas resources to supply domestic customers and improve security of supply
- Biomethane injection into gas grid is widespread in Europe, no material technical issues (it is just processing gas on a small scale)
- We have vehicles made by OEMs such as VW, MB and Iveco
- Put all this together and we can create a thriving domestic industry that is able to make a very material contribution towards the UK's 2020 targets

There are no material technical issues or barriers, we just need the BtG premium to be set at an appropriate level so that we can get on with it