Challenges in Green Gas

Towards a role for green gases in energy transition scenario's

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Experience you can trust.

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Covering the entire energy value chain

Gas and Electricity

Policy & Strategy

Production

Trading

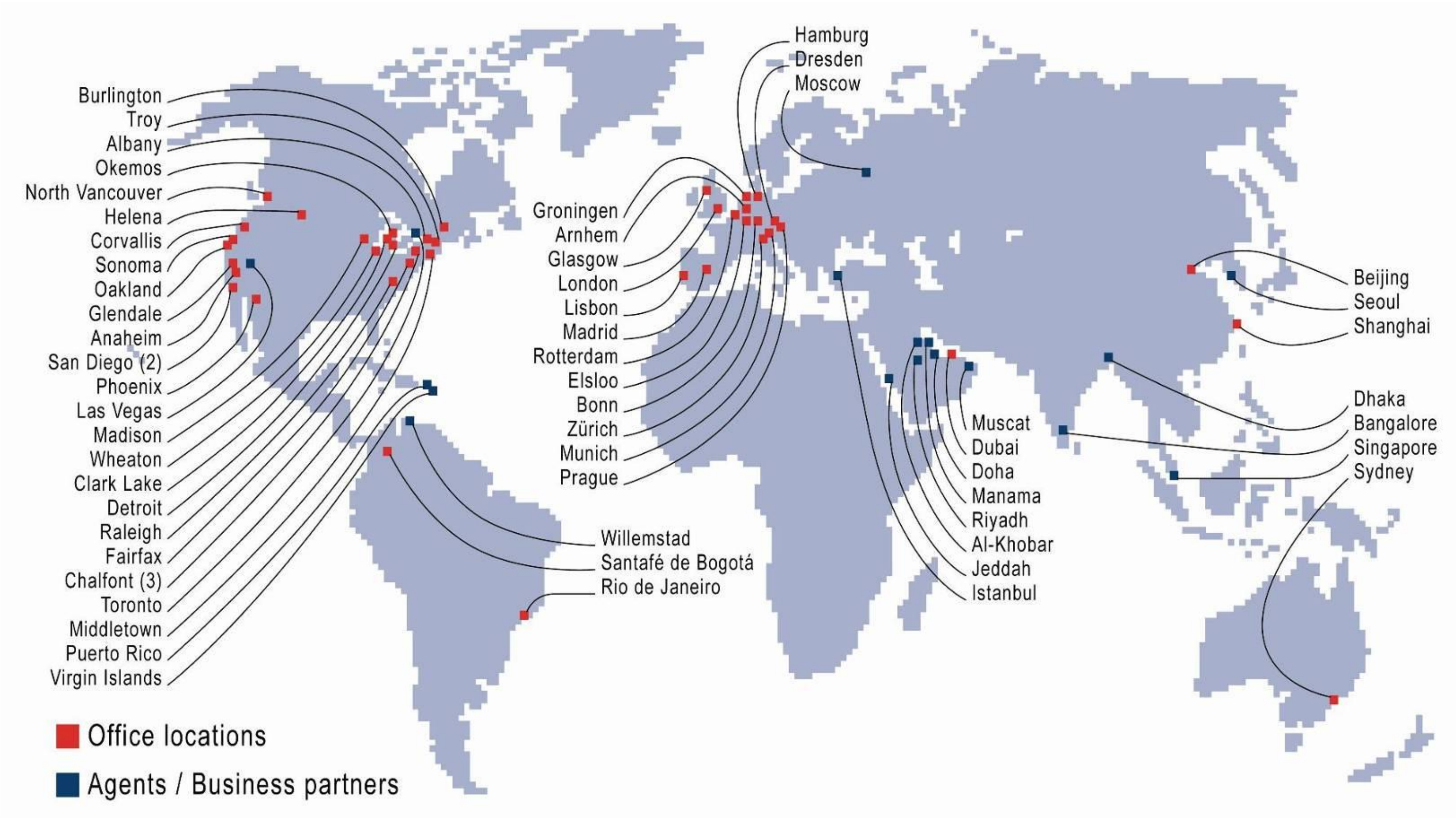
Transport & Distribution

Use

One company serving the diverse needs of the energy marketplace

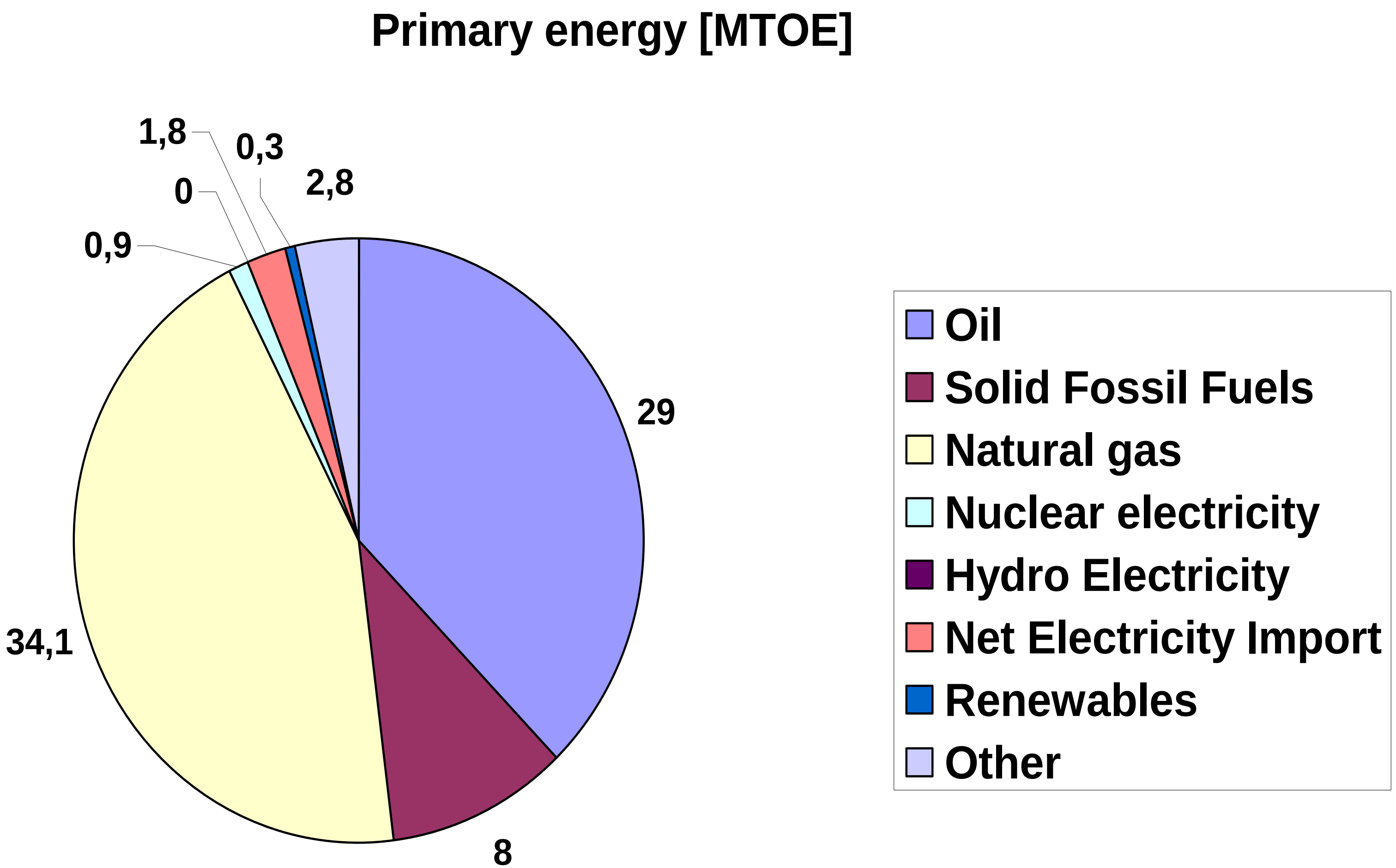
KEMA

Offering services around the globe!



KEMA

The Netherlands: a natural gas country



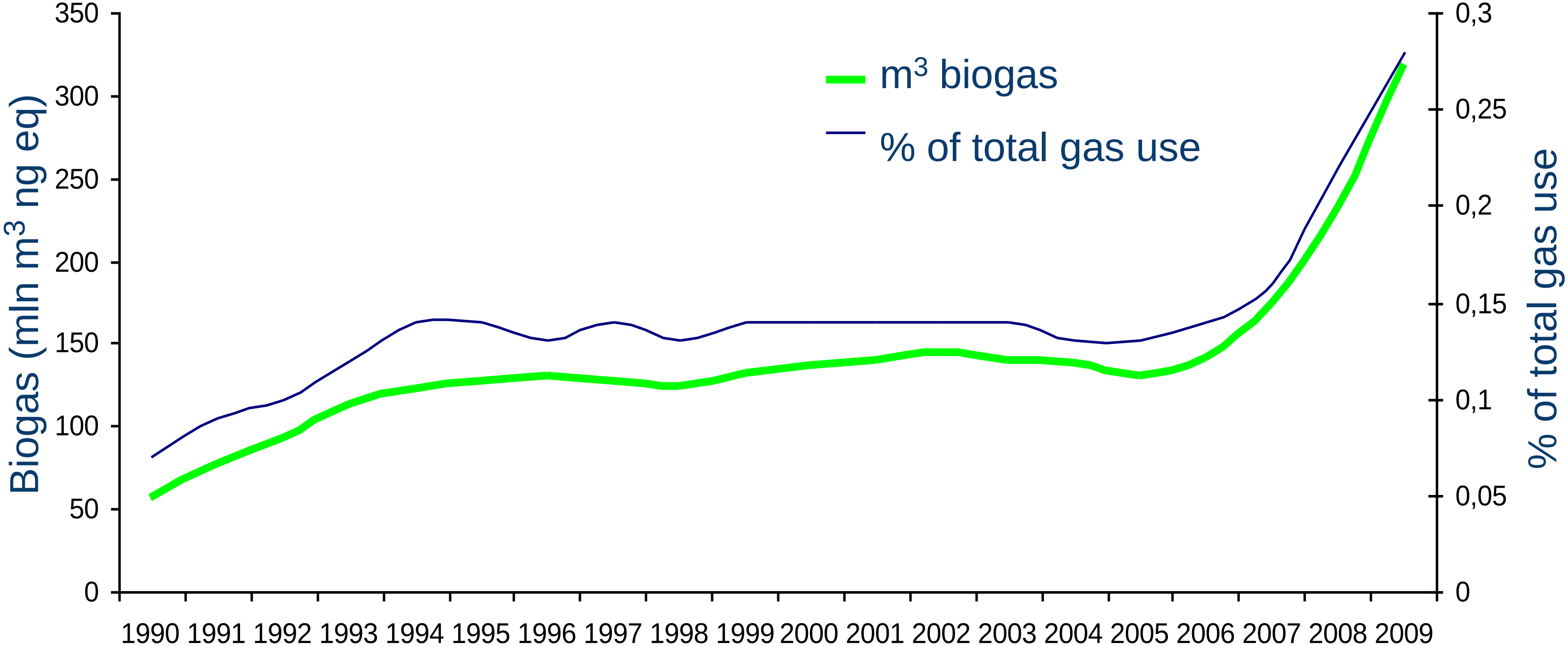
Source: Eurogas Annual Report

Green Gas in the Netherlands

- Green gas is biogas upgraded to ‘natural gas quality’
- Landfill gas: since 1987
- Fermentation gas: since 1995

Biogas in numbers (2009)

(NL 2009)



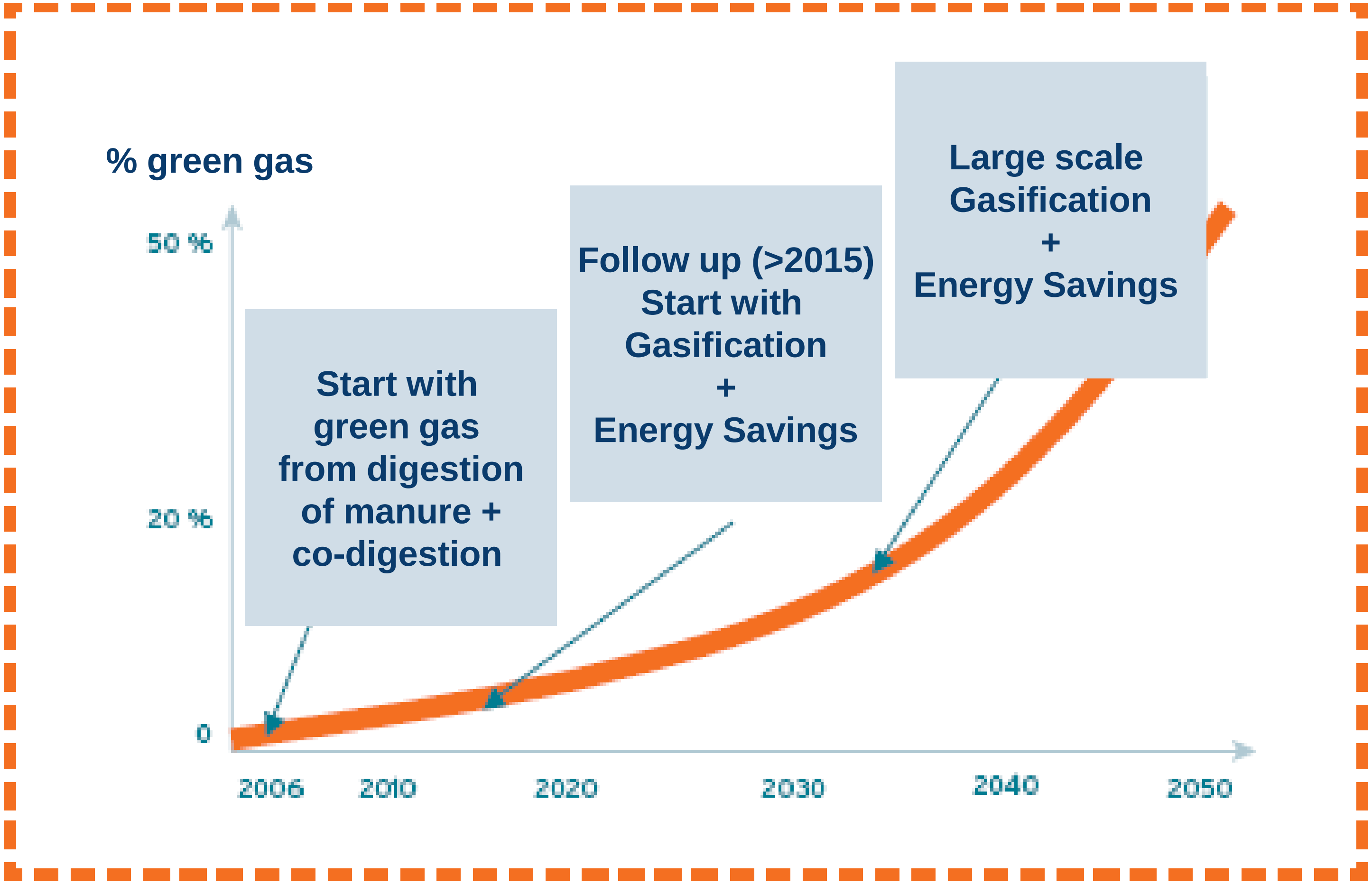
2009: 318 mln m^3 equivalent gas (incl. 40 mln m^3 green gas)

2011: expected 300 mln m^3 green gas

Source: CBS, 2010

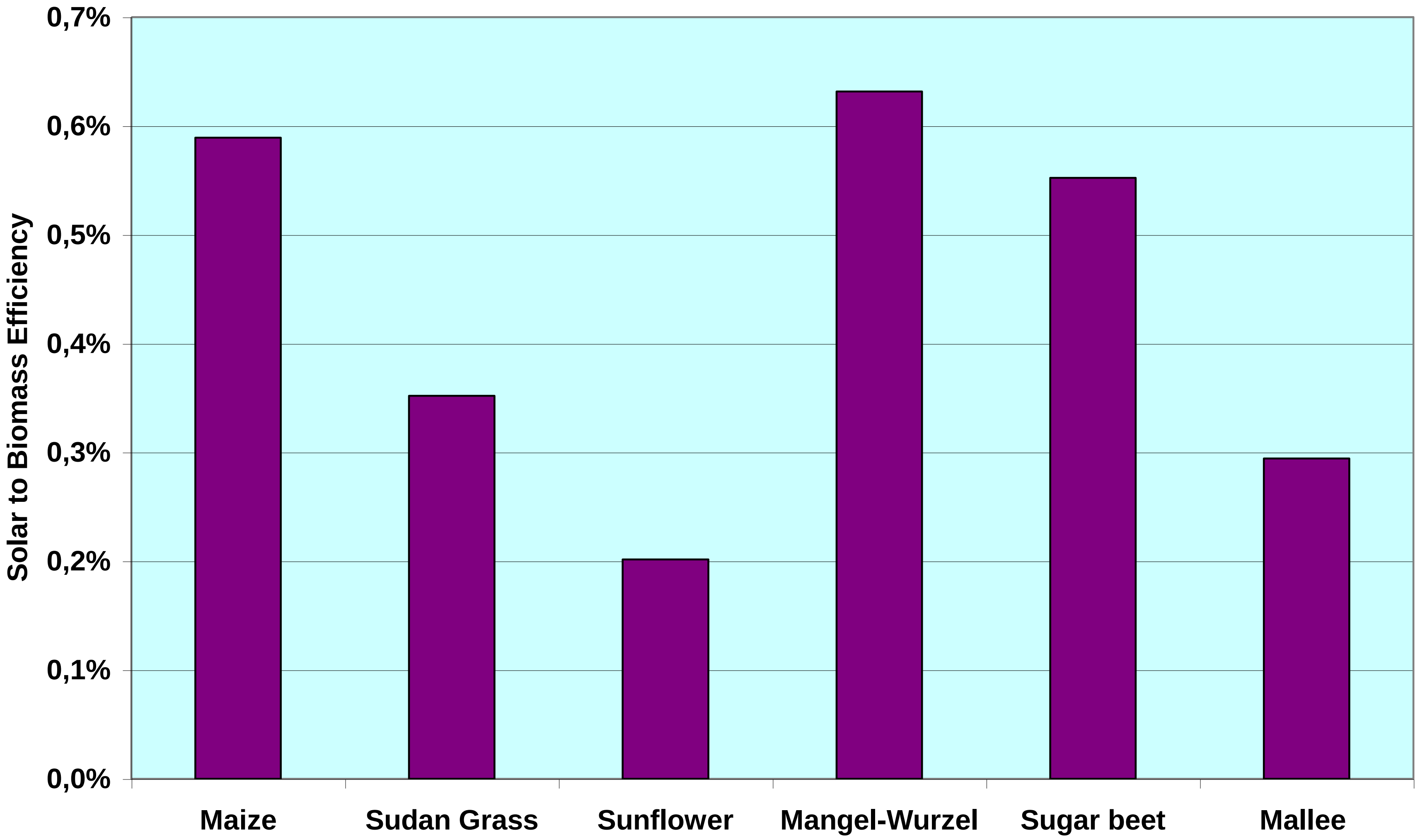
Policy ambitions for green gas

Transition route for replacing natural gas

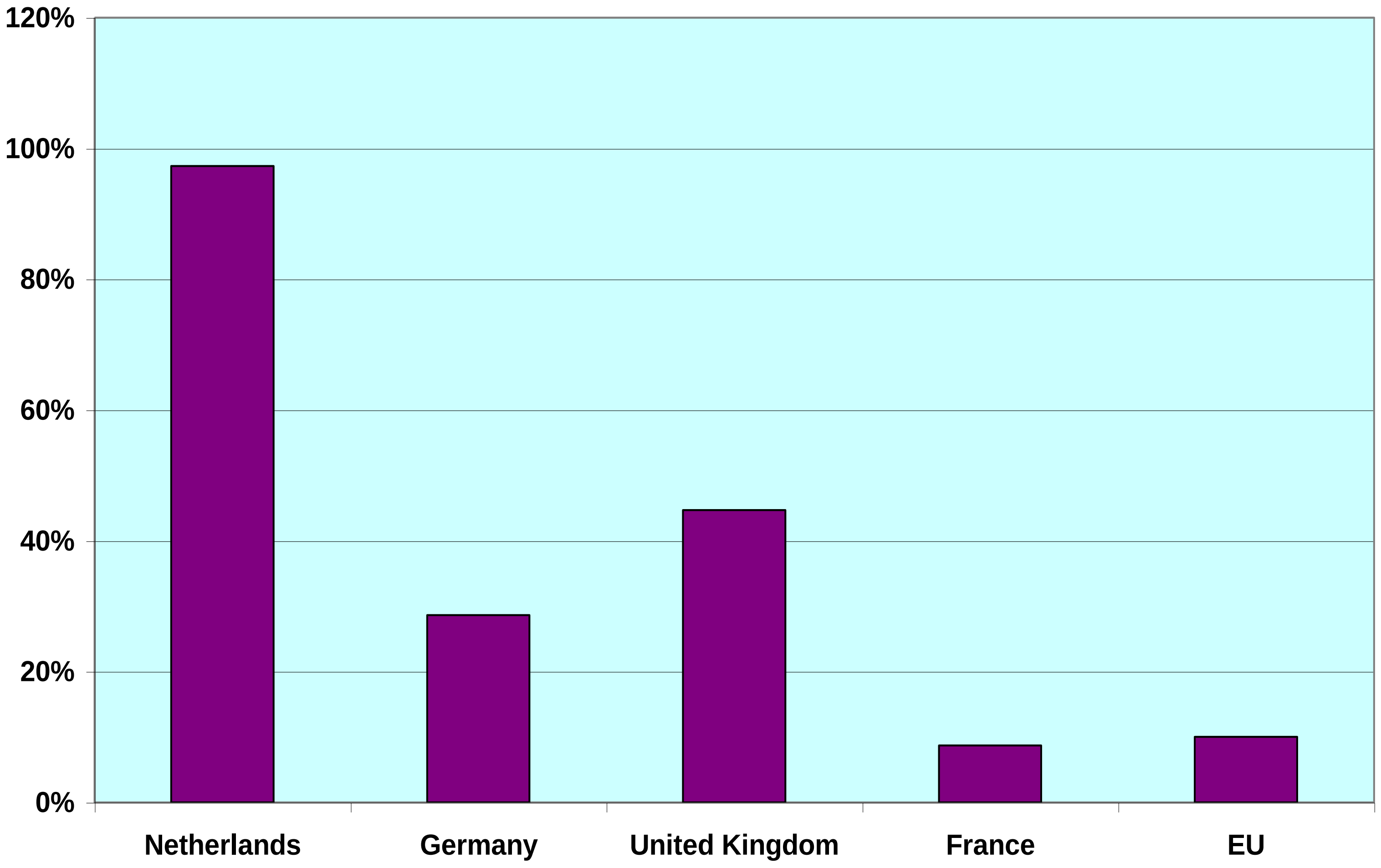


Source: New Gas Platform

Solar to Biomass efficiency is low!



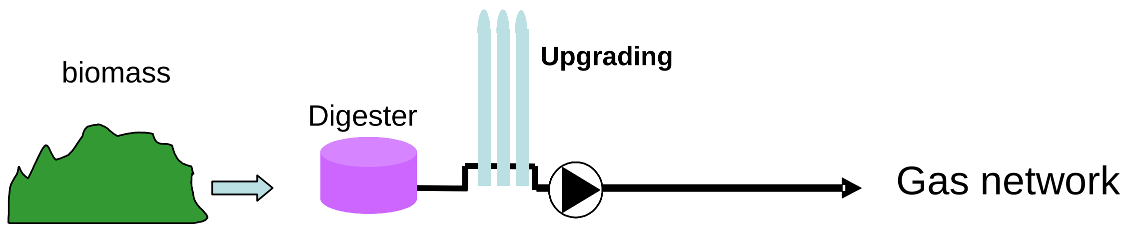
Surface area for gas production from biomass in 2030*



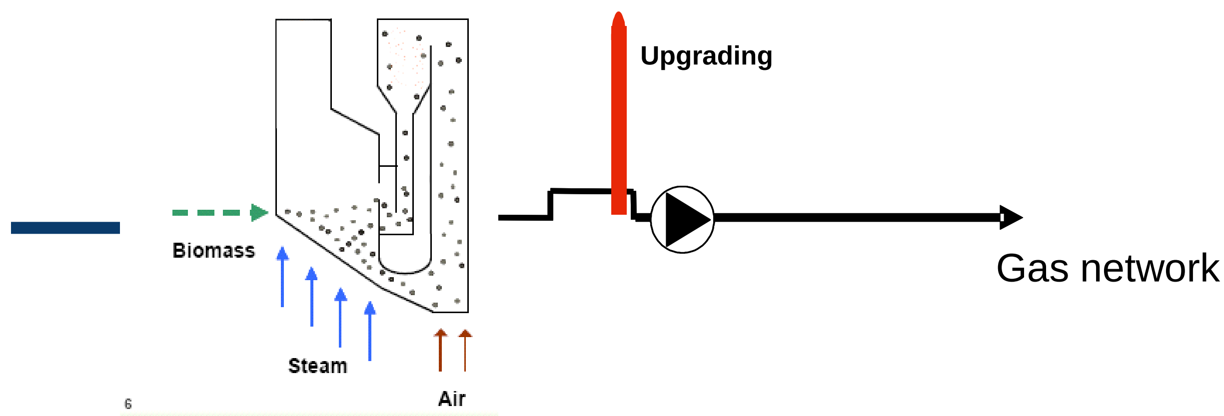
* Assuming 50% energy efficiency

Three pathways to green gas production

- Digestion (now)

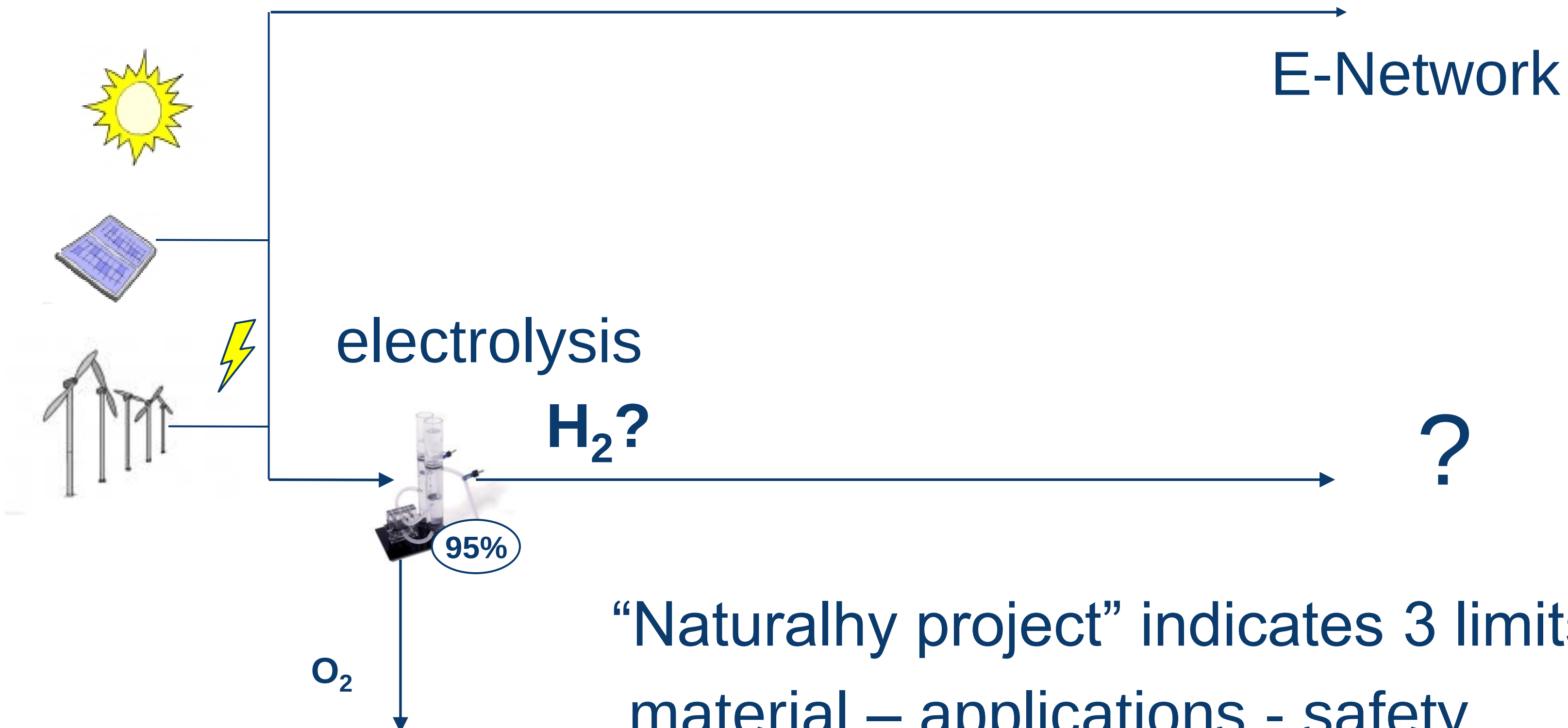


- Gasification (mid term)



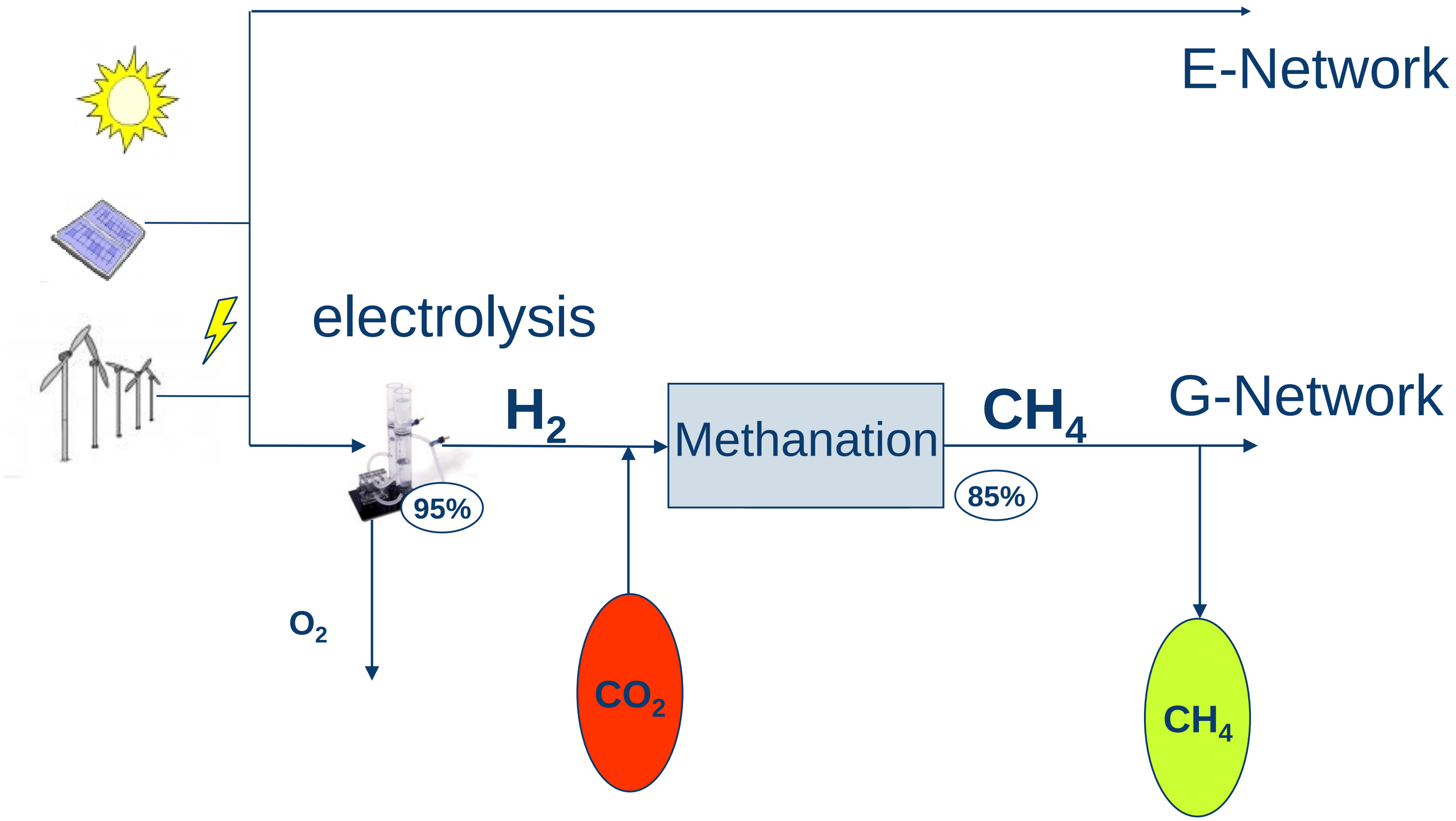
- Methanation (long term)

Methanation pathway (1)



"Naturalhy project" indicates 3 limits:
material – applications - safety

Methanation pathway (2)



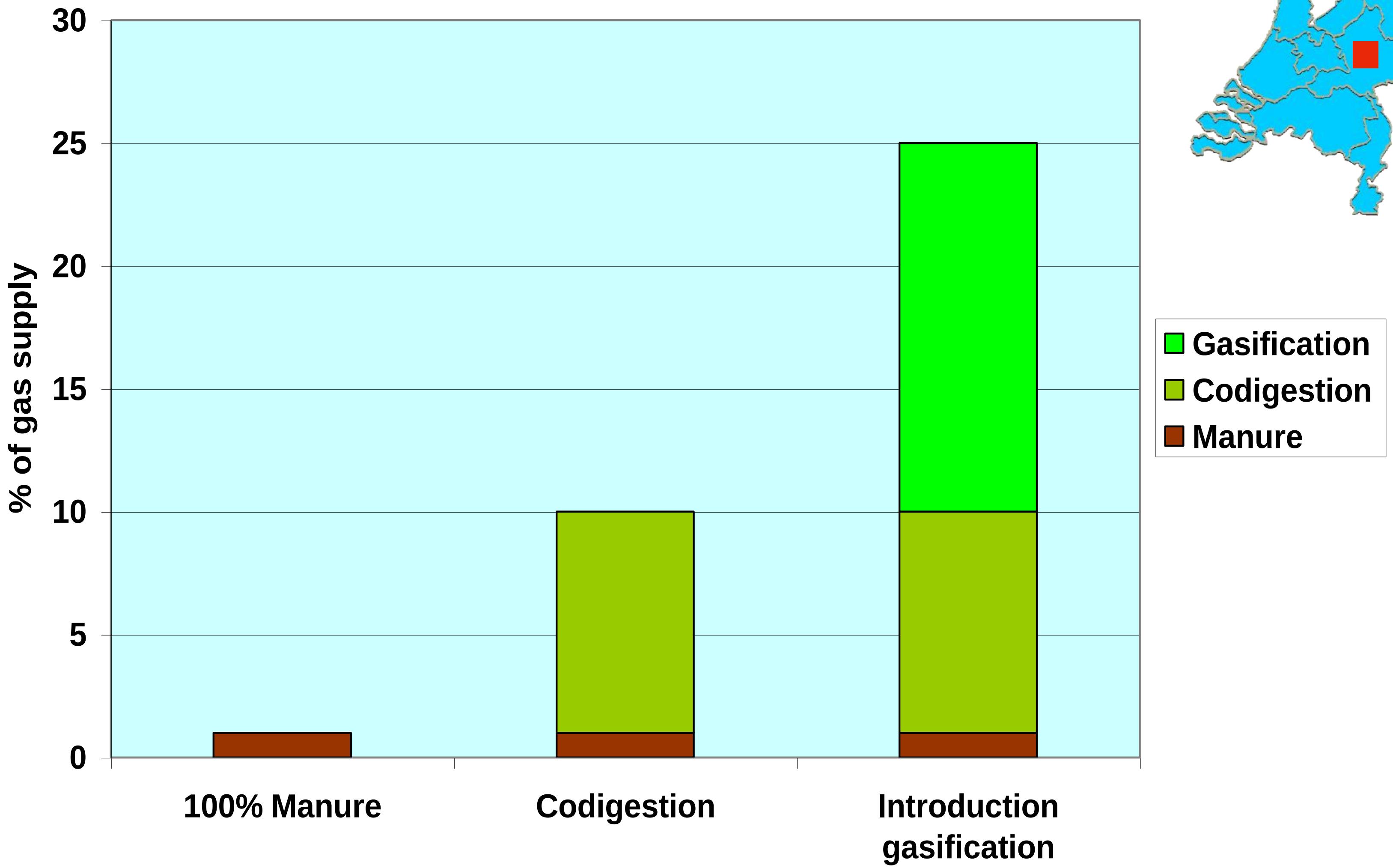
Methanation pathway (3)

- Utilizes the existing infrastructure
- Integrates (knowledge) of CCS, sustainable electricity and hydrogen
- Cheap long term storage
- No interference with the Food Feed Energy discussion
- No water problems
- The Netherlands are excellent experimental field

Farm waste: fermentation limitations in the Netherlands

- If at least 50% of substrate is manure the digestate may be used as fertilizer; if not, it classifies as chemical waste
- Co-substrate should be on the “positive” list (corn), or it classifies as chemical waste
- All manure that is transported is sampled (for mineral content)
- If digester size > 100 tons/day → Environmental Impact Assessment required

Possibilities for achieving targets

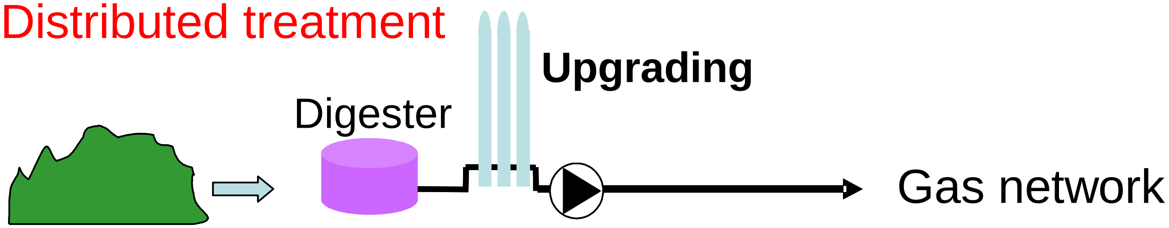


Energy savings are essential!

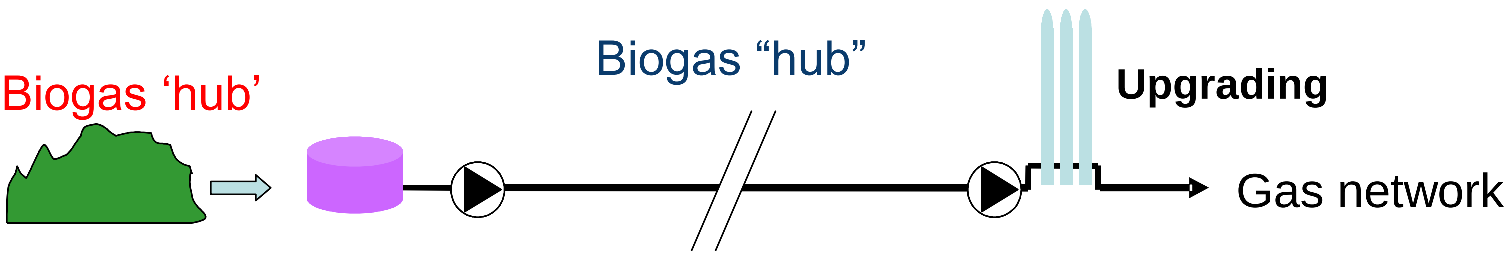
Three scenario's for green gas production

Characteristics of dairy waste: small farms, order of 100 cows or smaller

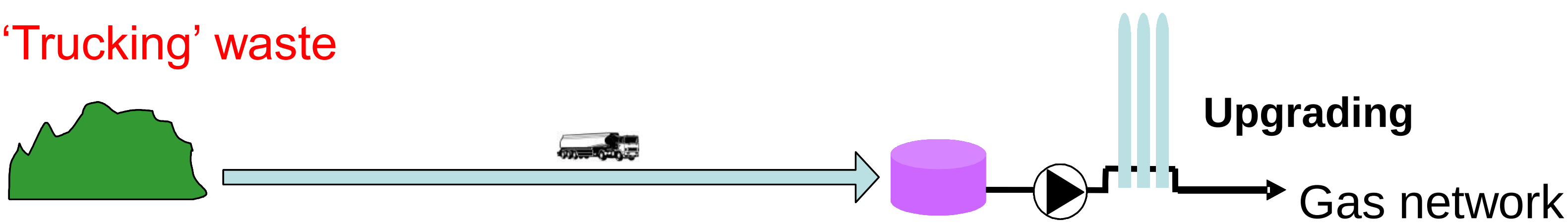
1. Distributed treatment



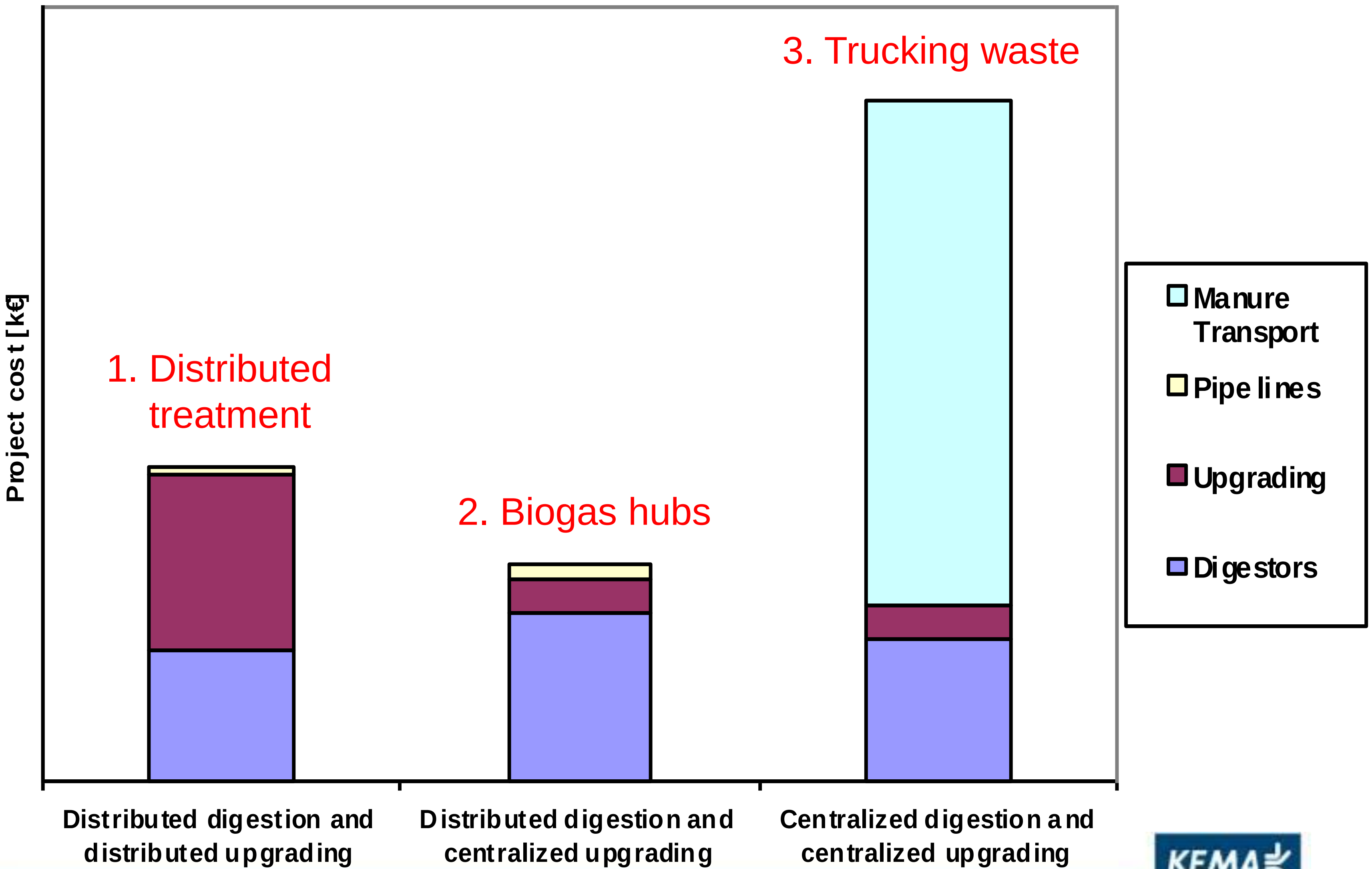
2. Biogas 'hub'



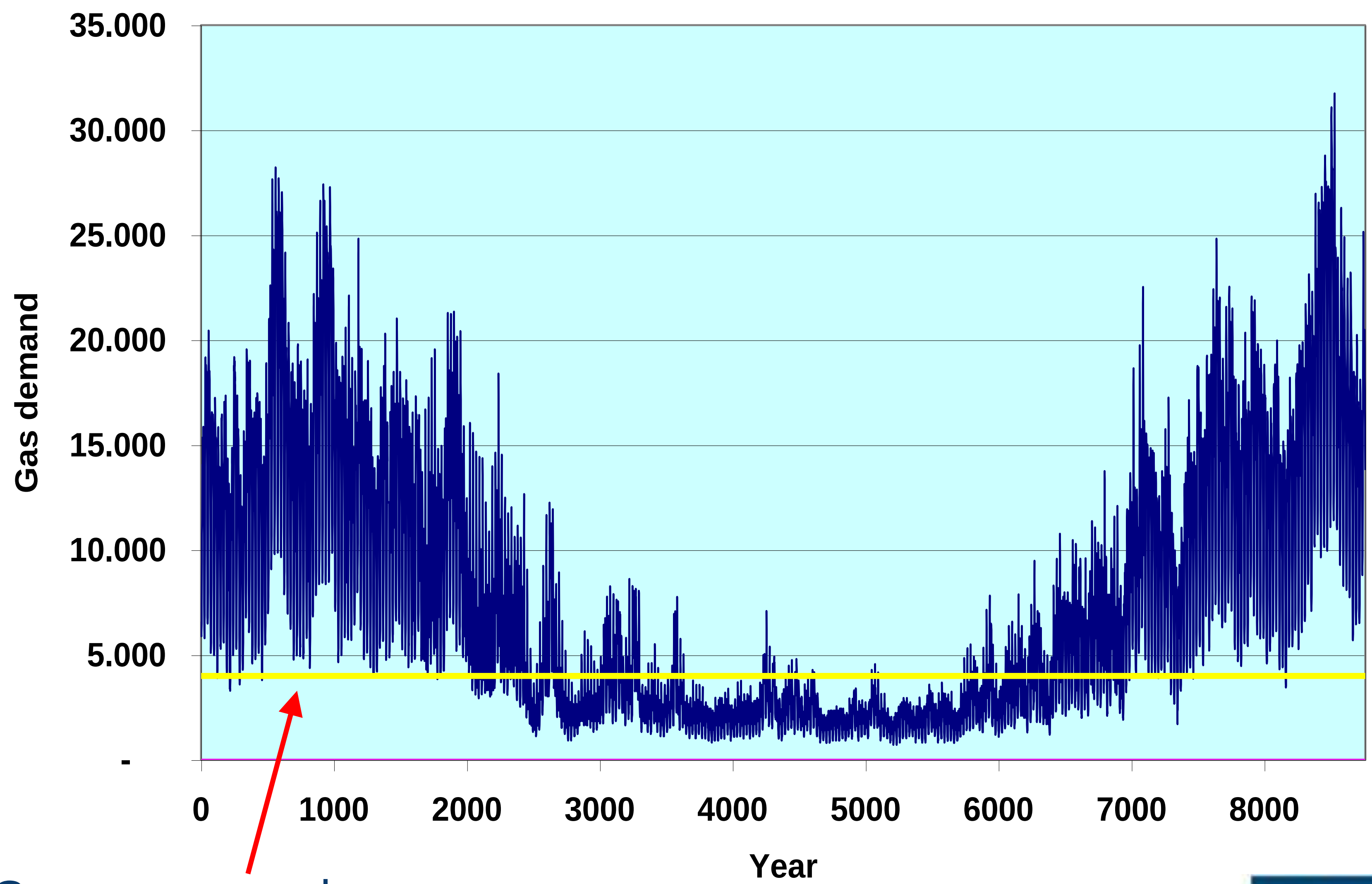
3. 'Trucking' waste



Comparison of three scenario's



Matching supply and demand, distribution grid

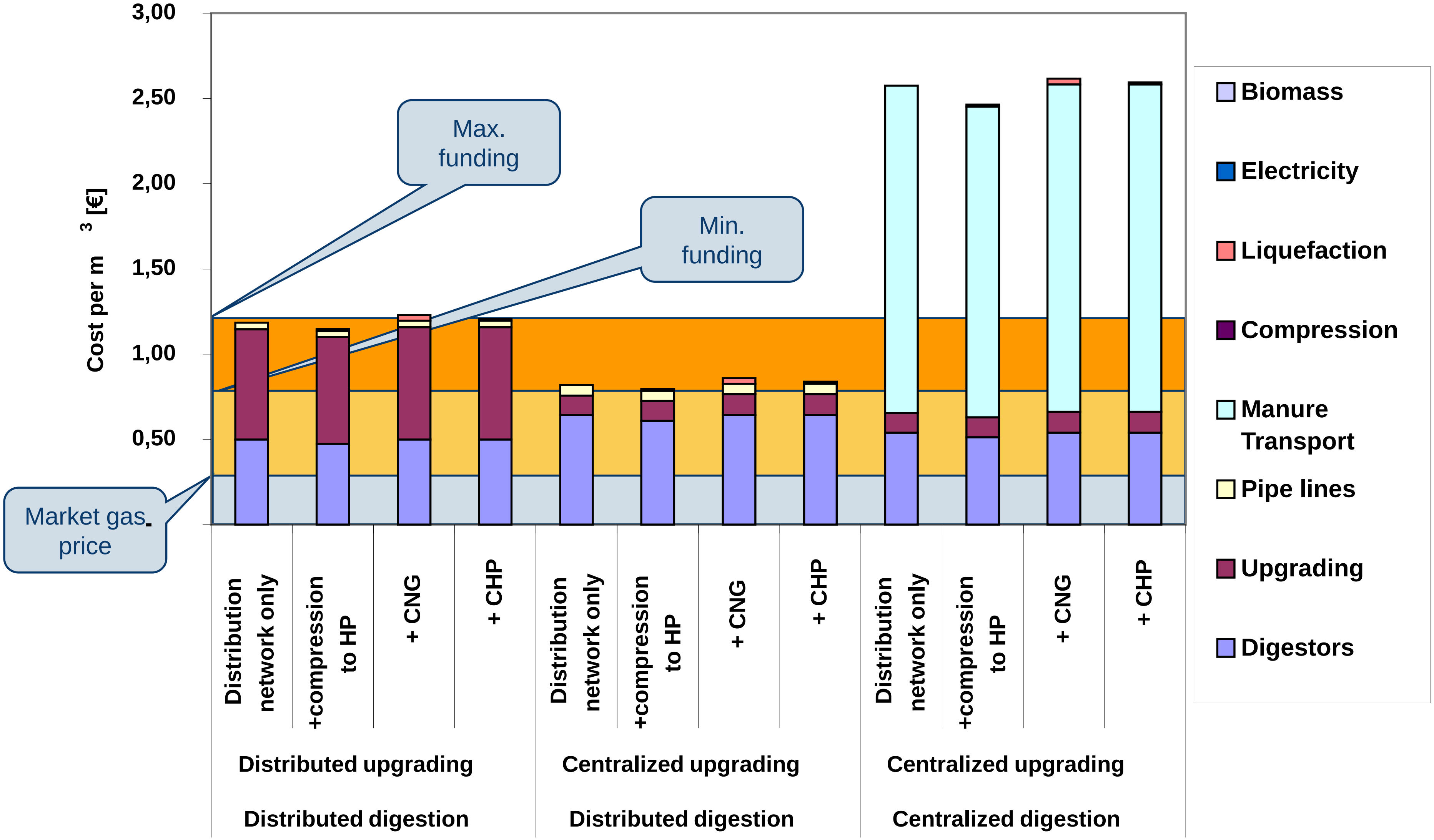


Green gas supply

Alternatives for summer period

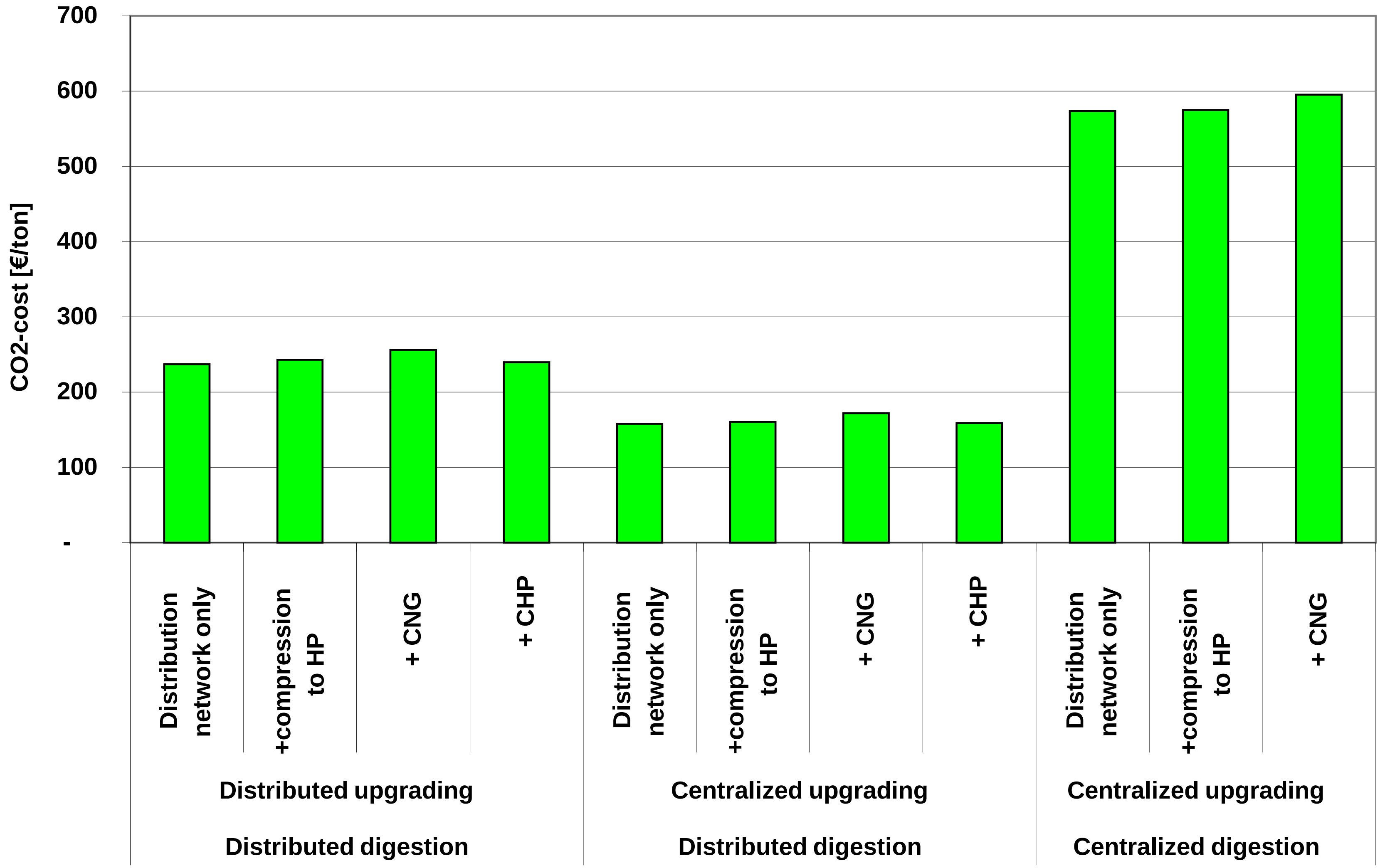
- Flaring the surplus gas
- Compress and feed into the high pressure network
- Compress and use for natural gas vehicles
- Fuel for a CHP-unit with heat distribution

Cost analysis of alternatives



Subsidy essential

CO_2 avoided cost of alternatives



Credit of €20/ton?

Requirements for injection into high pressure (transmission) gas grid

- Gas composition → processing and measurement
- Process Optimization and measurement
- Certification as green gas (subsidy)

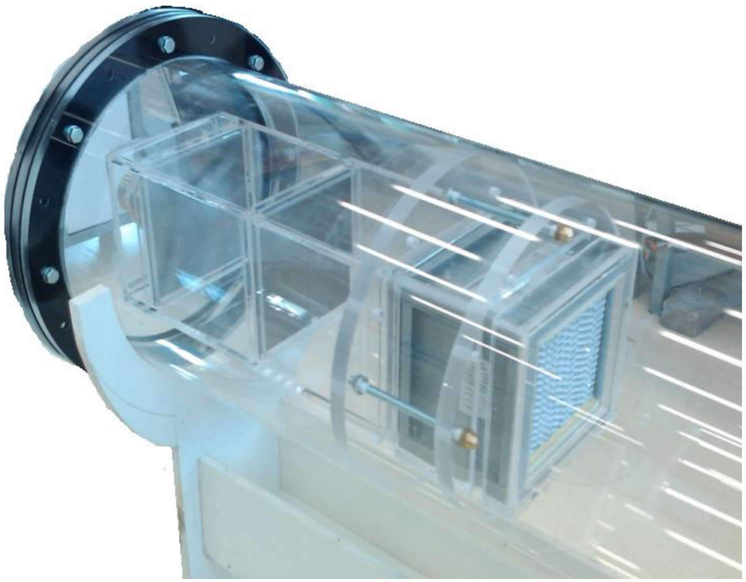
Specification (natural) gas components

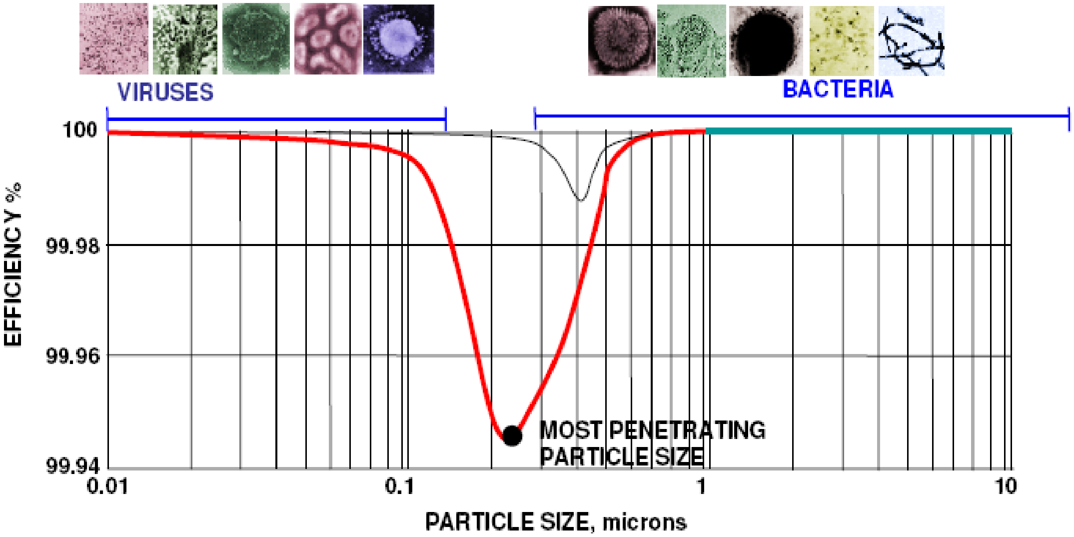
	Biogas	TSO (RTL)	DSO*
CO_2	30-50 %	<8 %	?
CH_4	50-70 %		
N_2	(<10 %)		
O_2	(<2 %)	<0,5 %	<0,5 %
H_2	(<0,5 %)	<0,02 %	12 %
H_2O Dewpoint	5-10 % 40^oC @1	40 mg/Nm3 -8^oC @72	250 mg/Nm3 10^oC @ 8 bar
H_2S	100 ppm-1,5 %	5 mg/Nm3	5 mg/Nm3
W_i (MJ/Nm^3)		43,36-44,41	43,36-44,41

DSO spec: under construction (will move towards TSO spec, except for CO2 - flame stability)

Process Optimization: current activities

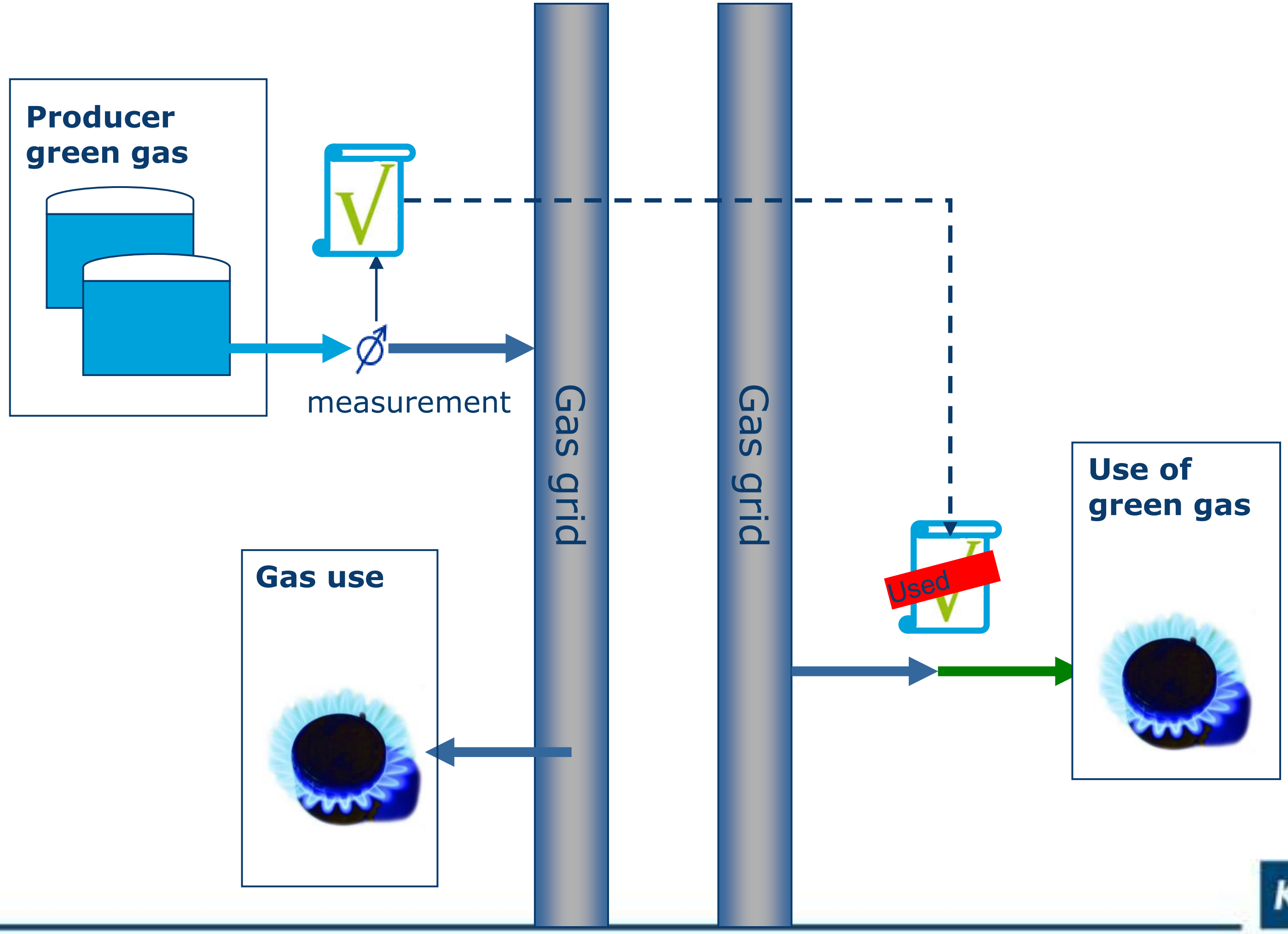
- Removal of Micro-organisms
- Odorization unit for low flows
- Low cost measuring equipment and goalkeeper





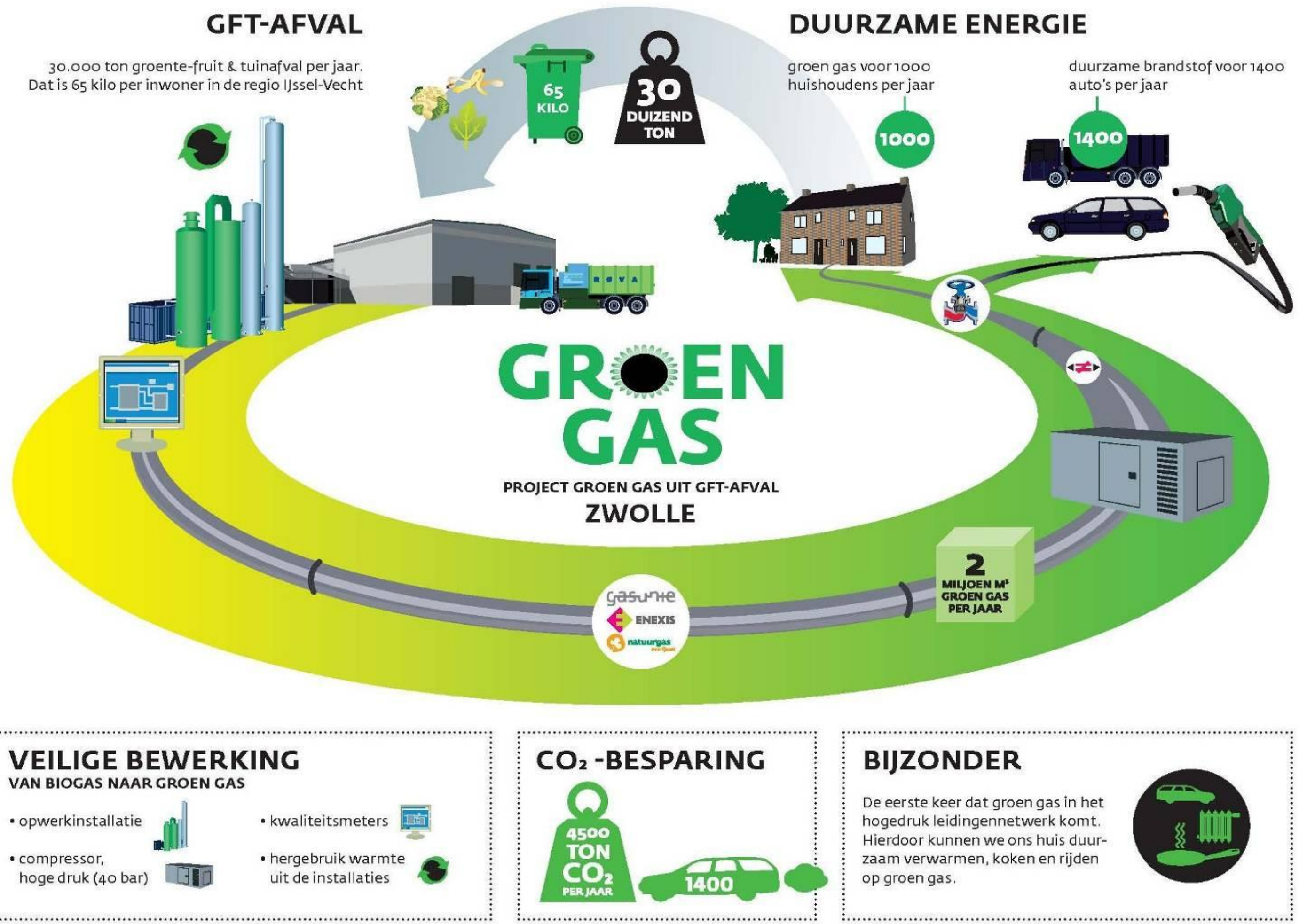
Certification: Vertogas

Green gas can be sold to consumers - scheme to guarantee authentic trade and qualify for subsidy



KEMA

Pilot plant in Zwolle: 2 million m^3/year from domestic biomass



Some images of the pilot plant (Zwolle)

Concluding remarks

- Green gas injection is an option for using natural gas as facilitator of renewables
- Production and upgrading gas from dairy/domestic waste is achievable, including injection into high pressure system, but it is expensive (in NL) - subsidies are essential at present
- Limitations due to scale, laws regarding waste products, gas quality standards
- Ultimate domestic potential limited by available area for biomass
- Room for innovation in treatment schemes and monitoring

Thank you for your attention

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