



Energy research Centre of the Netherlands

Development of substitute natural gas from biomass in the Netherlands

A. van der Drift

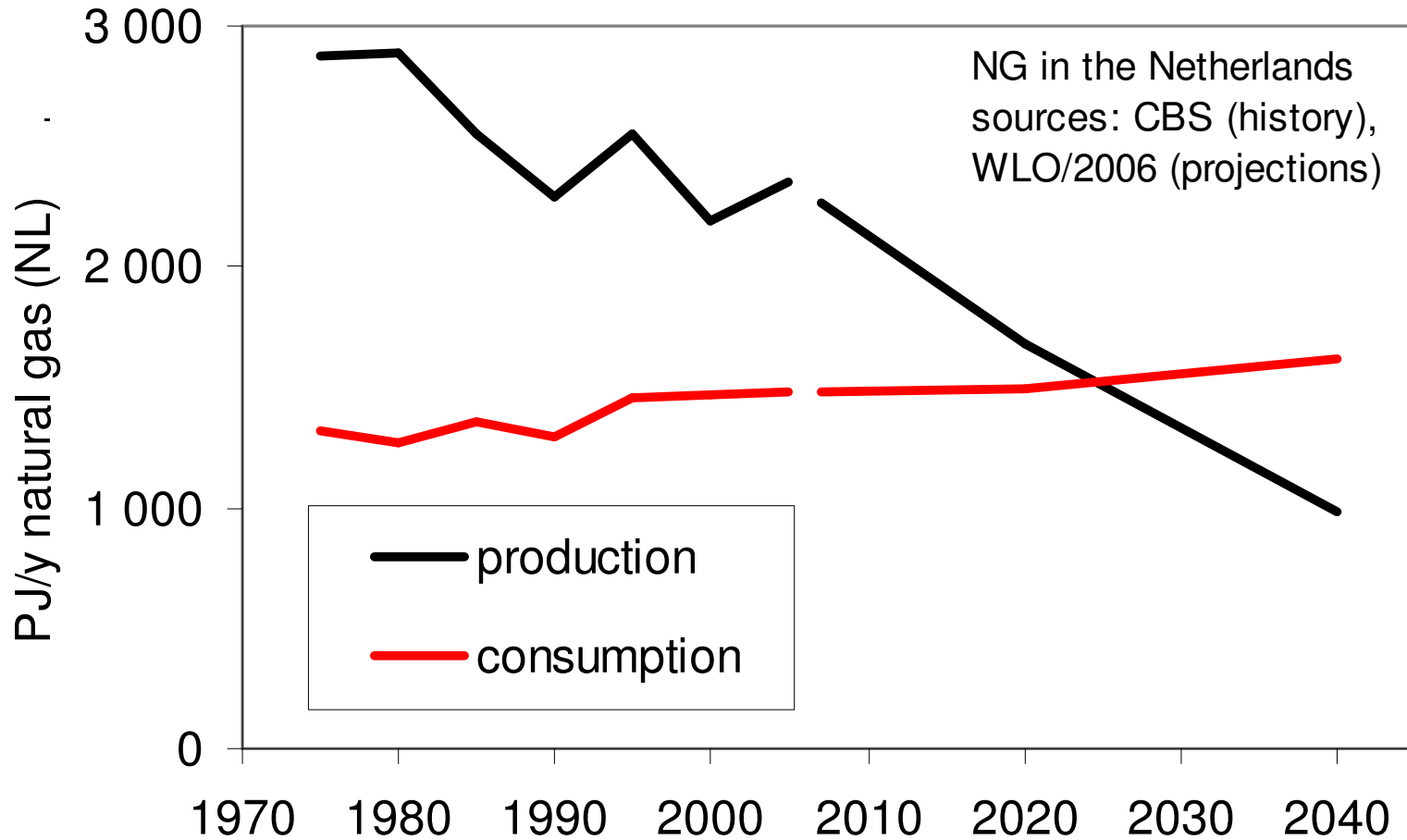
Presented at Natural Gas Substitution from Biomass - a review of the situation,
Güstrow, Germany, 26th & 27th August 2008

DEVELOPMENT OF SUBSTITUTE NATURAL GAS FROM BIOMASS IN THE NETHERLANDS

Bram van der Drift

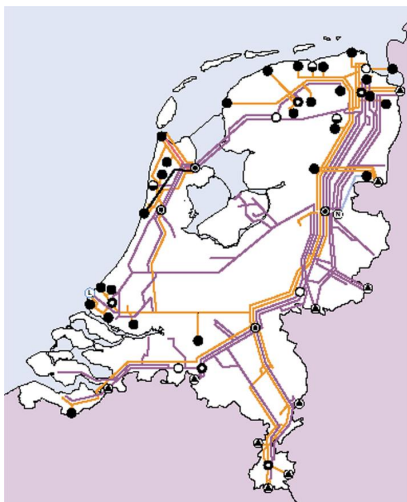


NETHERLANDS: LAND OF NATURAL GAS (1)



NETHERLANDS: LAND OF NATURAL GAS (2)

- almost 50% (~1500 PJ/year) of primary energy is Natural Gas
- 135 000 km pipe line: in average *within 120 m*
- 94% of houses connected to gas grid
- international grid connections



NATURAL GAS FOR TRANSPORTATION

coming up soon...

- CNG filling stations network upcoming: 250 filling stations in NL in 2011
- considered as step to biogas (and bioSNG...)
- www.CNGnet.nl

*AutoWeek nr. 6,
13 Feb. 2008*



AMBITIOUS ENERGY TARGETS

... a long way to go...

effect	2006	2007	2010	2020
RE (from 20% EU target)	2.8%	2.6%		14%
RE (national government)				20%
RE in power	6.5%	5.8%	9%	
RE in transport (biofuels)	0.4%	2%?	5.75%	
CO ₂ (national government)	3%			30%

THE WORD “SNG”

- Ministry of Economic Affairs/ energy transition (document “Vol Gas Vooruit” www.energietransitie.nl): 20% green natural gas by 2030, 50% by 2050
- Gasunie target: 12.5% green natural gas by 2030
- Gasunie sets up certification system for green natural gas (quality and origin)
- Subsidy on Green Biogas since 1st April 2008
- 250 filling NG stations by 2011, target: biogas / SNG

ECN TECHNOLOGY DEVELOPMENT

the reference

lignite-to-SNG (US)

~3000 MW input

~55% SNG (100 PJ/y) and ~13% energy by-products



ECN TECHNOLOGY DEVELOPMENT

the hard truths

- coal-based systems are not suitable for biomass
- biomass is more expensive than coal

meaning:

- high efficiency is of major importance
- new biomass-based technology required

ECN TECHNOLOGY DEVELOPMENT

the choices of ECN



using existing
technologies

selection and
combining

new technology
development

ECN TECHNOLOGY DEVELOPMENT

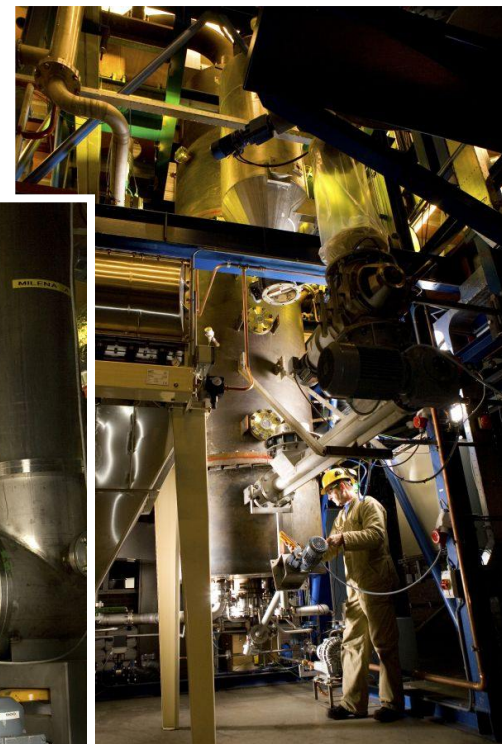
gasification technology

MILENA technology:

- high methane yield
- complete conversion
- fuel flexible



25 kW



800 kW

ECN TECHNOLOGY DEVELOPMENT

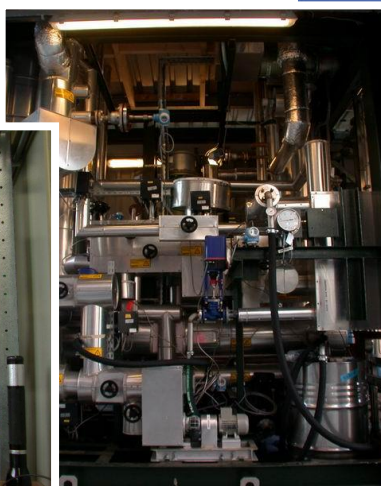
gas cleaning (1)

OLGA tar reduction:

- no methane reduction
- tar recycle to gasifier



2 m³/h



200 m³/h



2 000 m³/h



25 000 m³/h

ECN TECHNOLOGY DEVELOPMENT

gas cleaning (2)

S, Cl, dust, ...:

new combinations of
existing technologies



2 m³/h test facility: 10 multipurpose reactors

ECN TECHNOLOGY DEVELOPMENT

status

- operating system at lab-scale ($\sim 2 \text{ m}^3/\text{h}$): biomass conversion to clean CH_4 , H_2 , CO , CO_2 , H_2O , ready for SNG synthesis
- gasifier and tar removal available at pilot-scale ($\sim 200 \text{ m}^3/\text{h}$)

ECN TECHNOLOGY DEVELOPMENT

future

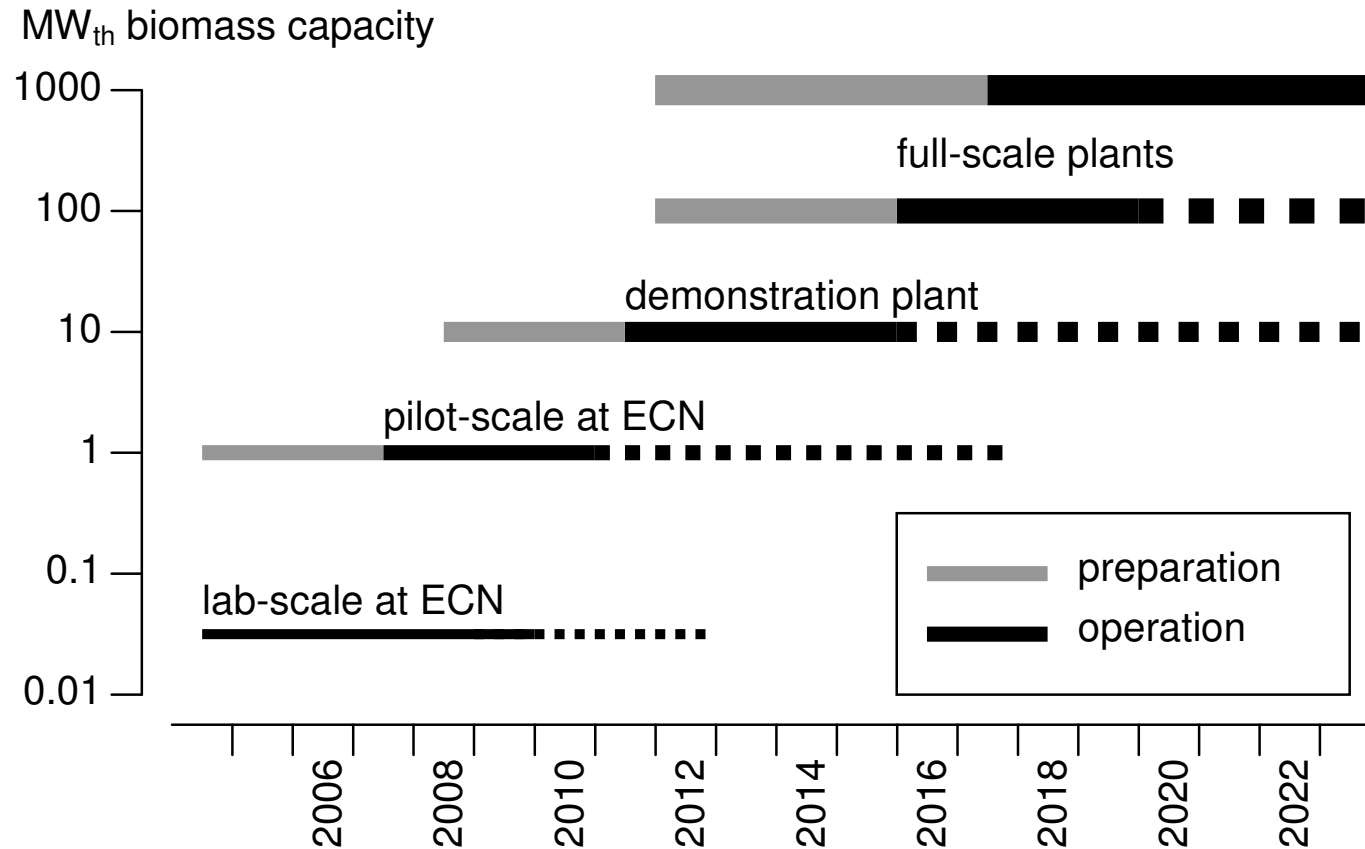
- lab-scale facility extended to SNG/CNG
- long-term tests on lab-scale

- pilot-scale tests
- extension with further gas cleaning

- preparation of demonstration plant

ECN TECHNOLOGY DEVELOPMENT

ECN time schedule



ECN TECHNOLOGY DEVELOPMENT

objective

- full-scale BioSNG plants (100+ MW)
- 70-75% net energy efficiency from biomass to BioSNG
- pure CO₂ as by-product, available to double CO₂-reduction potential
- 5 €/GJ BioSNG plus biomass feedstock costs
- ...major contribution to CO₂ reduction

CONCLUSIONS

- bioSNG has great potential
- ECN approach: make use of coal-based technology if possible, only develop biomass-specific parts
- biomass-to-SNG efficiency can be 70-75%
- 40% of (already C-neutral) carbon from biomass leaves system as CO₂: bioSNG can go far beyond CO₂-neutral
- bioSNG costs are among the cheapest renewables

- ECN lab-scale system available and operating
- ECN pilot-scale ready for testing
- demonstration plant 2011

MILENA OPENING EVENT

Thursday, 4th September 2008, the pilot MILENA gasifier at ECN will be opened officially by the minister of “VROM”. You are invited!



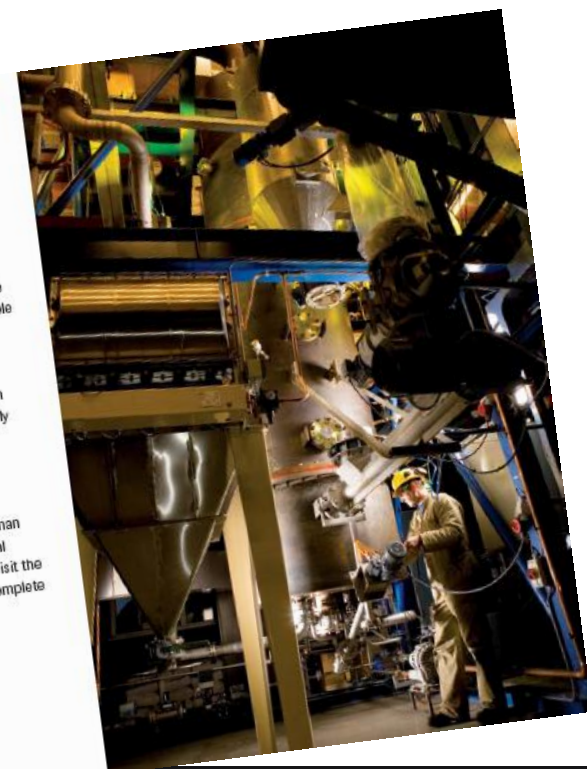
Program September 4th

Opening ceremony (Dutch spoken)

- 12.00 hrs Buffet lunch
- 13.00 hrs Welcome by Ton Hoff, Managing Director ECN
- 13.05 hrs Ulco Vermeulen (chairman of Energy Transition platform New Gas) will speak about the future role of Green Gas in the transition to a more sustainable energy supply in the Netherlands
- 13.15 hrs Ton Hoff will touch upon the role of biomass and particularly the Milena technology
- 13.25 hrs Minister Jacqueline Cramer will give her view on the developments and subsequently will officially open the new Milena pilot plant
- 13.45 hrs Time for questions

Informative Tour and reception (English spoken)

- 14.00 hrs After a short introduction by Jan Willem Erisman (unit manager Biomass, Coal & Environmental Research), you will have the opportunity to visit the facilities, including the pilot plant and the complete lab-scale plant
- 15.30 hrs Reception
- 17.00 hrs Closure



MORE INFORMATION

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publications: www.ecn.nl/publications

composition database: www.phyllis.nl

tar dew point calculator: www.thersites.nl

IEA bioenergy/gasification: www.ieatask33.org

Milena indirect gasifier: www.milenatechnology.com

OLGA: www.olgatechnology.com

SNG: www.bioSNG.com and www.bioCNG.com