



Energy research Centre of the Netherlands

Scale-up of the MILENA biomass gasification process for the production of Bio-SNG

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www.ecn.nl

ECN: Energy for the Future



Largest Dutch R&D institute in the field of energy;
independent and committed (ECN in IPCC)

“Missing link” between fundamental academic research and market
application

**Ambition: cutting edge R&D that influences the European transition to a
sustainable energy system**

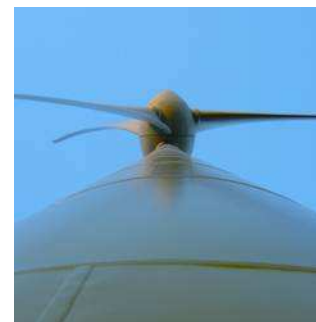
R&D units



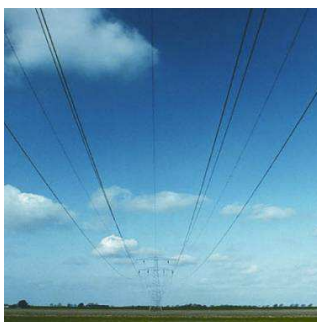
Solar energy



Biomass



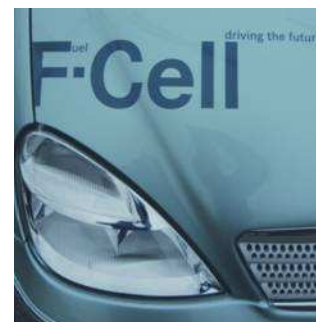
Wind energy



Efficiency &
Infrastructure



Policy
Studies



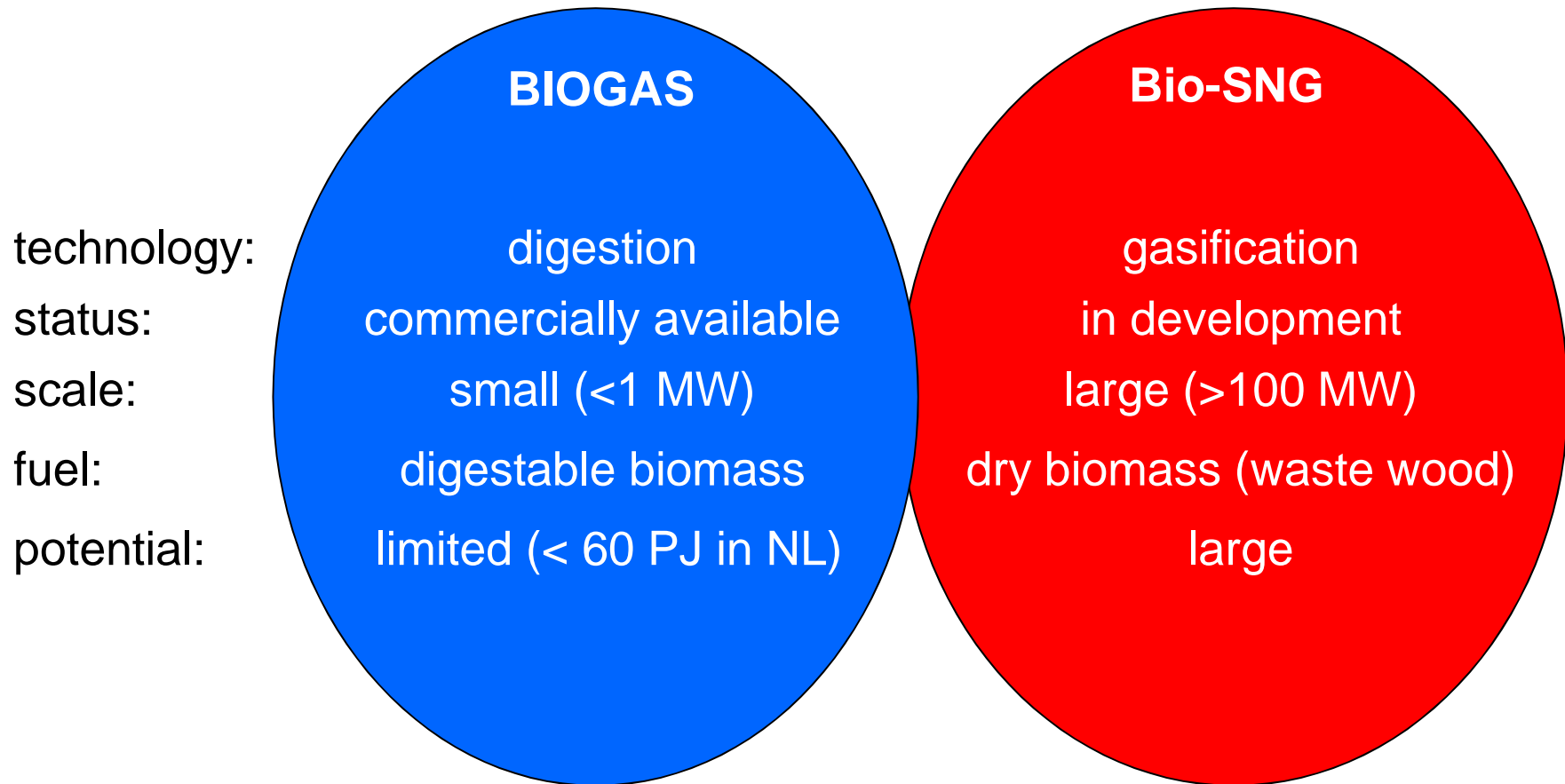
H₂ & Clean
Fossil Fuels

Why Bio-SNG?

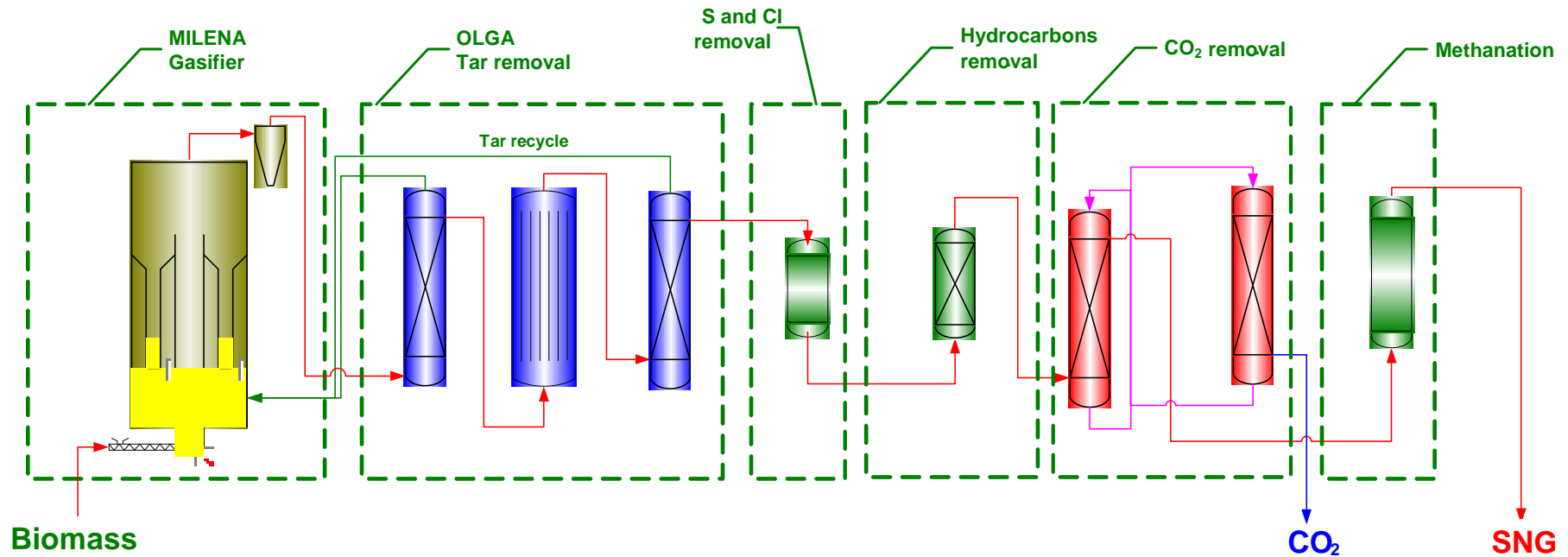
- Natural gas is the main primary source of energy in the Netherlands and fossil natural gas reserves are in decline -> renewable alternative required.
- Bio-SNG has many applications: Heat and electricity production, feedstock for chemical industry and recently as a transport fuel.
- Efficiency from biomass (wood) to fuel is significantly higher for Bio-SNG than Bio-FT (70% compared to <50%).
- Beyond CO₂ neutral, including sequestration of CO₂ the process becomes CO₂ negative

PRODUCING BIO-SNG

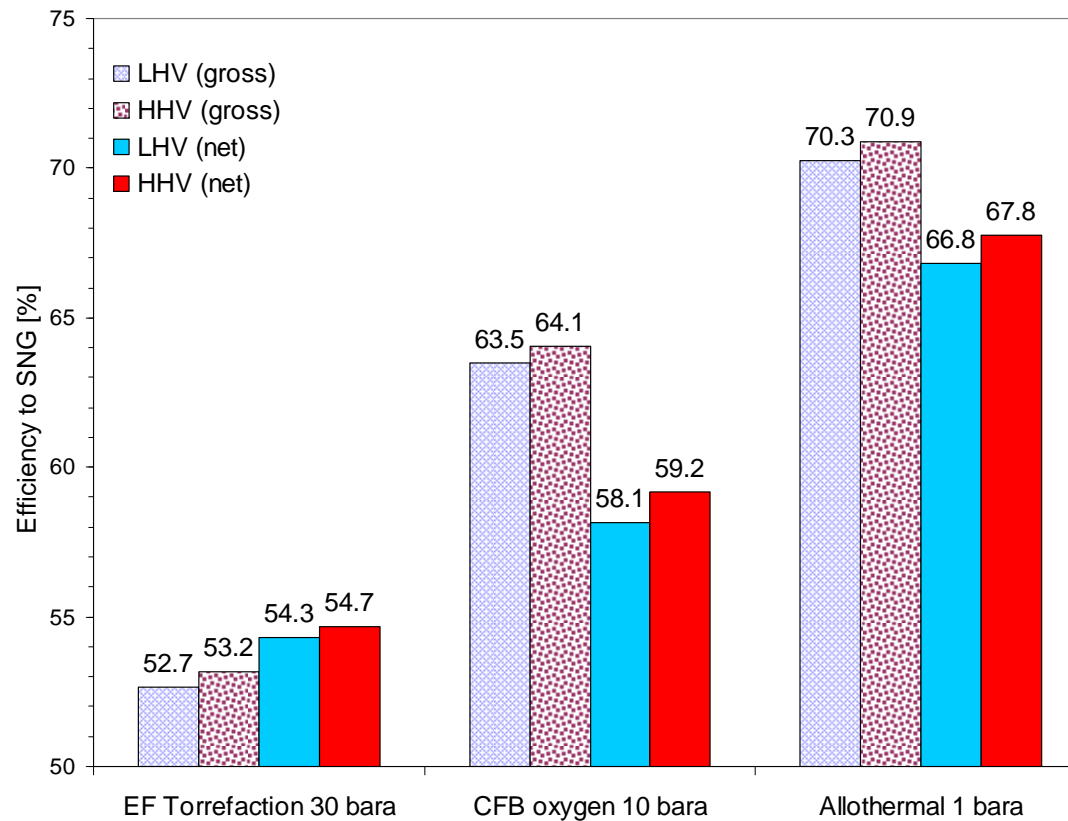
two ways



ECN Bio-SNG production process

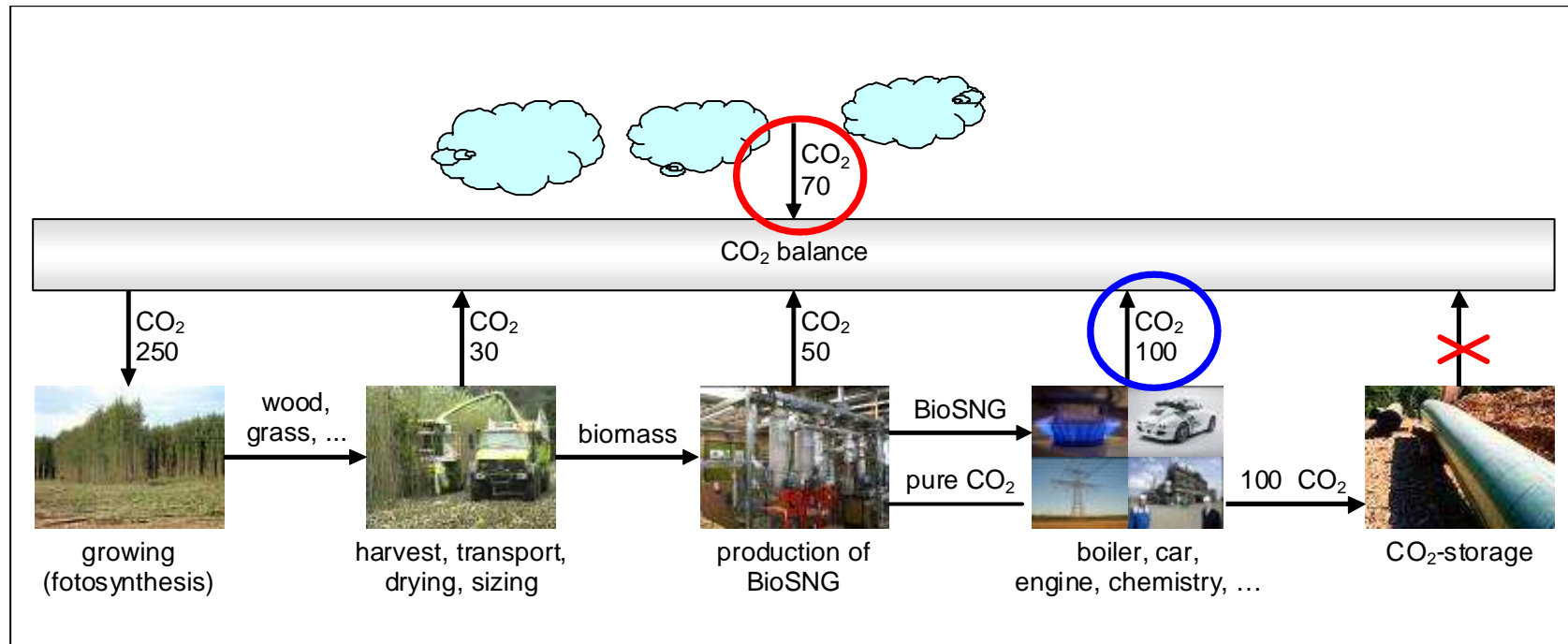


Calculated overall efficiencies to Bio-SNG



BEYOND CO₂ NEUTRAL

BioSNG with CO₂ storage



CO₂ emission: 100 → -70
 170% CO₂ emission reduction

Lab scale Bio-SNG installation

First integrated tests in 2006

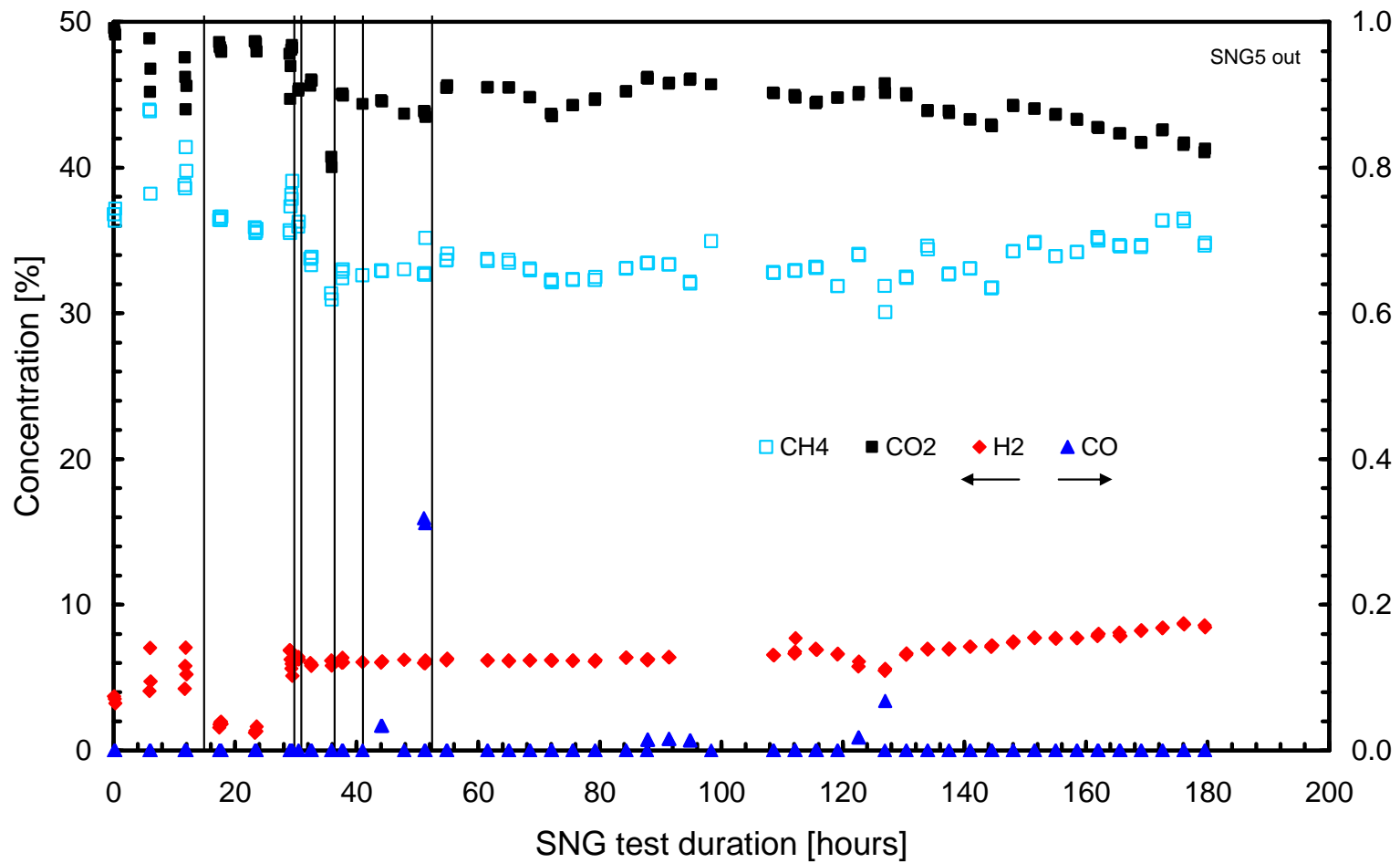


MILENA
gasification

OLGA
Gas cleaning

Methanation

Experimental lab-scale results (Nov 2008)



Results from lab-scale testing

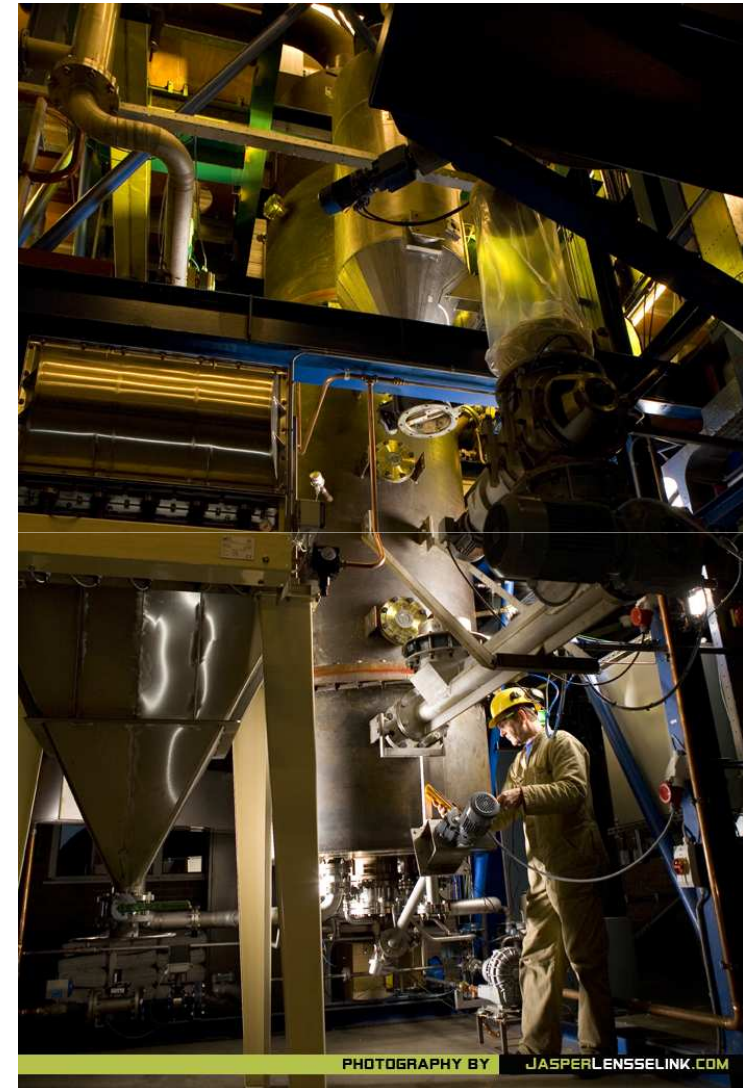
- Gasifier is running reliable, gas composition according expectations.
- Different biomass fuels are tested. Wood is most promising fuel, but other biomasses can be used as well.
- Gas cleaning is tested.
- Suitable methanation catalysts are selected and tested, with good results.
- Process ready for long duration tests and scale-up.

Construction of MILENA gasifier pilot plant

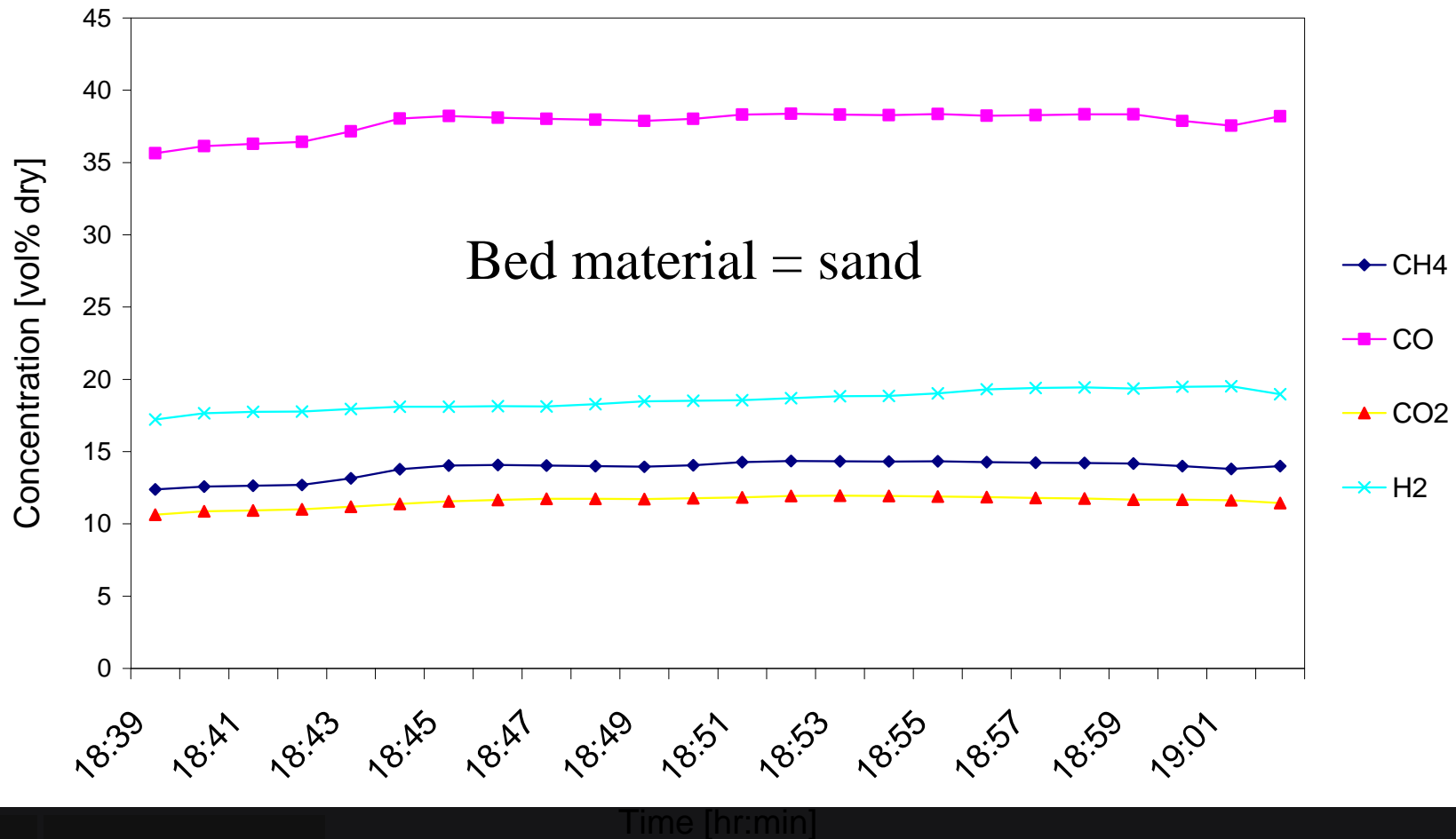


MILENA pilot plant

- Thermal input 160 kg/h (800 kW HHV)
- Design fuel dry wood
- Gasifier / Riser diameter: 0.2 m
- Combustor diameter: 0.8 m
- Total height: 8 m



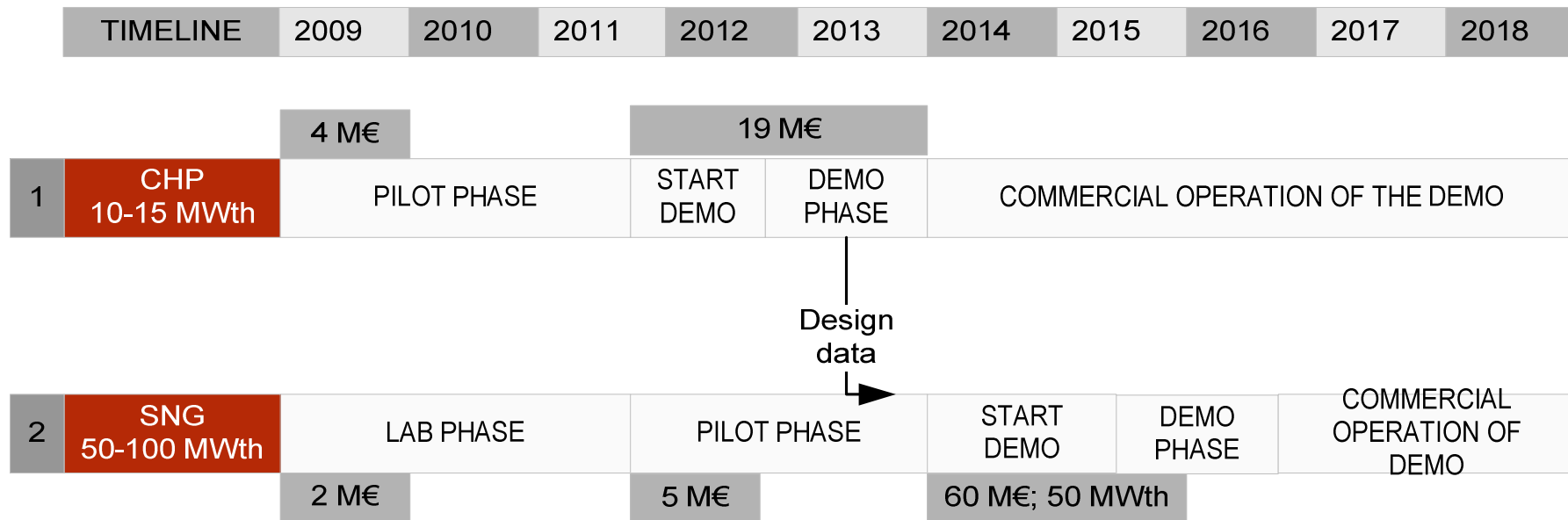
First pilot scale results



Present Bio-SNG activities

- The lab-scale installation is modified to make automated tests possible.
- Duration tests are prepared to test the selected catalysts.
- Duration test MILENA pilot gasifier connected to OLGA pilot plant at the beginning of 2009

Future plans of the HVC and ECN



MORE INFORMATION

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MILENA information: www.milenatechnology.com

Bio-SNG / Bio-CNG: www.biosng.com