

THE NETHERLANDS COUNTRY REPORT

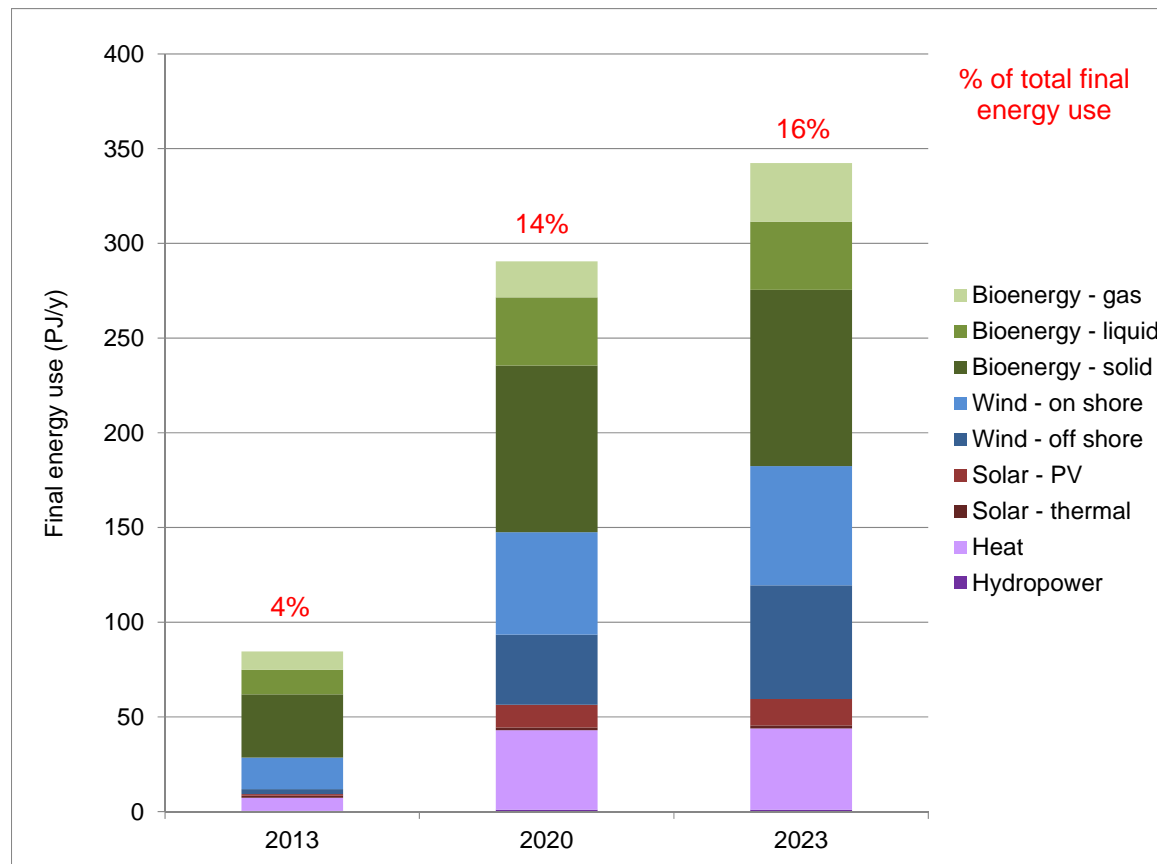
Bram van der Drift

Karlsruhe, Germany
3-5 November 2014

www.ecn.nl

ENERGY AGREEMENT

“energieakkoord 2013”



Biomass has and will have dominant share in renewable energy in Netherlands

Biomass will increase from current 56 PJ/y to 143 PJ/y in 2020

WHAT PEOPLE WANT



“people want renewable energy obligation system”



bioSNG PLANT in ZUTPHEN

announced fall-2014



- 8 mcm/y green gas, 14 MW wood input
- No details on technology, but words mentioned: fluidized bed (scheme suggests indirect gasifier), fabric filter, ESP, RME scrubber, amine scrubbing
- Public hearings with worries: 30 meter high, #trucks per day



Artist impression of 14 MW wood-to-SNG plant in Zutphen, the Netherlands

TORRGAS

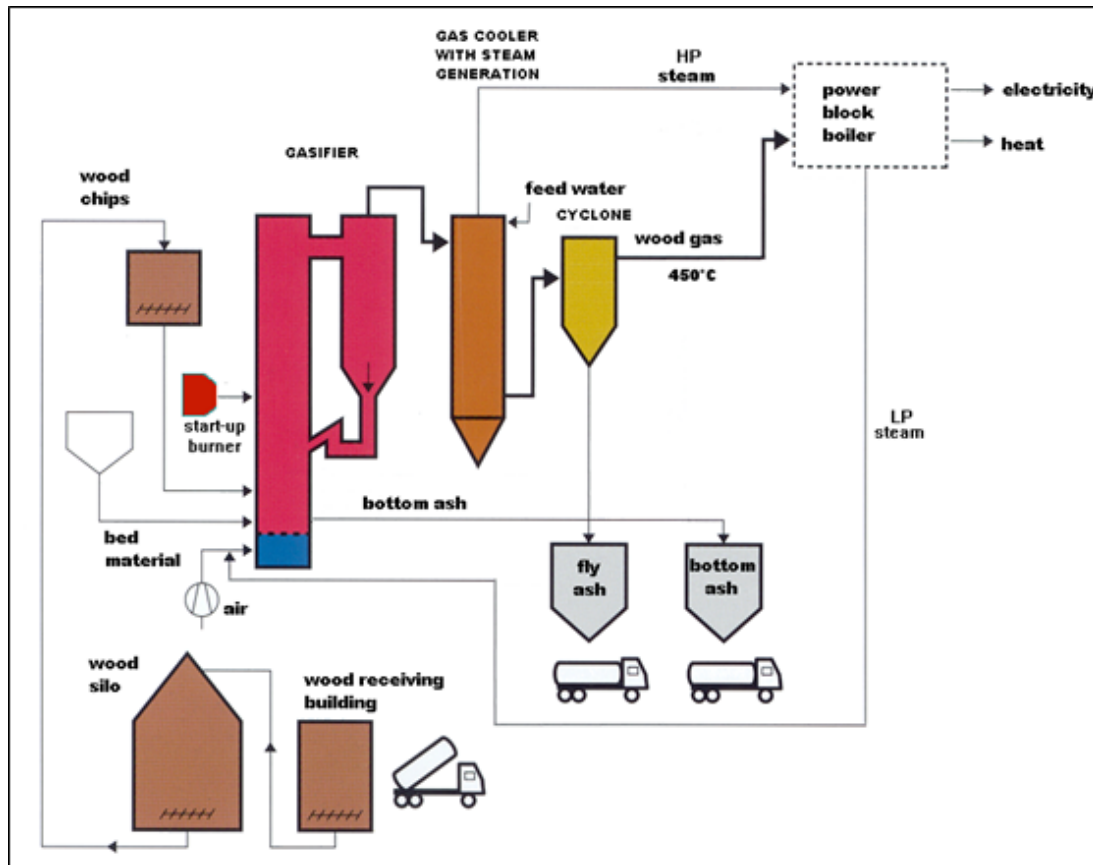
- Torroidal gasification technology
- Torrefied wood gasification
- 0.5 MW plant in Alkmaar (planning)
- 25 MW plant in Delfzijl (planning)
- Final goal: chemicals and fuels



torrgas

ESSENT INDIRECT CO-FIRING

second life for 85 MW CFB gasifier

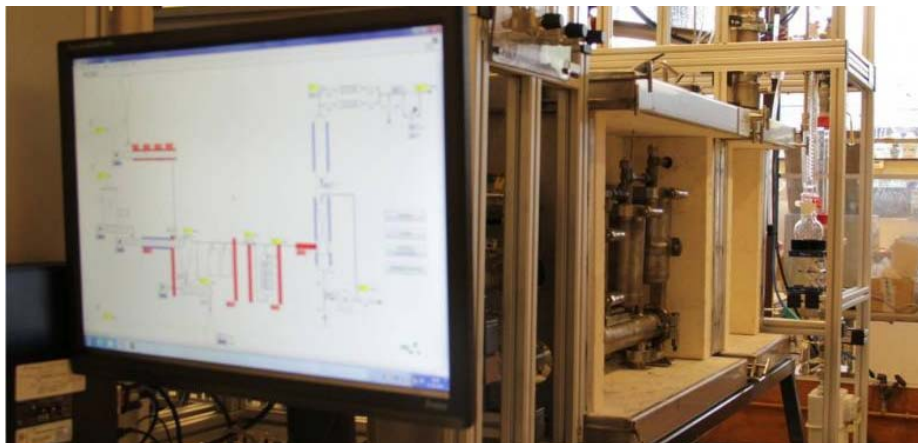


BIOBTX

jointly owned by KNN and Syncom



- Focus on bioBTX production from biomass and waste
- Closely cooperating with University of Groningen
- Several small-scale test facilities available
- Two-step approach:
 - Low-temperature gasification/pyrolysis
 - Production of bioBTX



A Over
EemsdeltaGreen

B Stakeholders
aan het woord

C Projecten

D Nieuws

E Duurzaamheidsverslag
2013

F Contact

Gelukt!

Benzeen, toluen en xyleen (BTX) zijn de belangrijkste grondstoffen van hoogwaardige kunststoffen. Niels Schenk en zijn collega's van BioBTX hebben een manier gevonden om uit biomassa BTX te maken.



Liever componenten dan brandstof



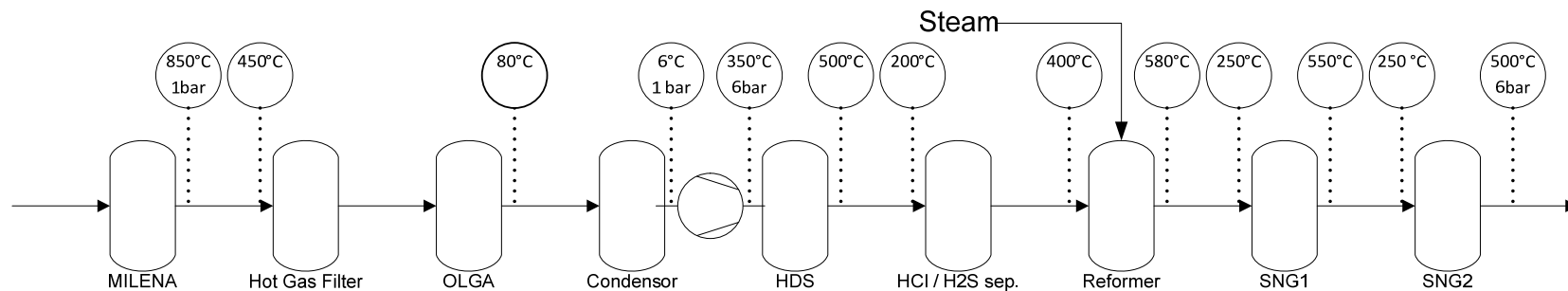
ECN DEVELOPMENTS



500h test completed successfully

- 500 hours of testing October 2014
- Complete lab-system with
 - MILENA gasification
 - OLGA tar removal
 - ESME system for bioSNG production

- CO₂ removal at moderate pressure to avoid methane loss/polution
- BTX conversion before CO₂-removal to avoid BTX loss/polution
- BTX conversion and methanation in one adiabatic reactor at moderate pressure to keep it simple and efficient
- Methanation without cooling/recycle



ECN's lab test facility for biomass-to-SNG. Upscaled plant would: not have hot gas filter, have amine scrubber for CO₂-removal after reformer/before 2nd compressor, high-pressure methanation final step(s)

MORE CHEMISTRY



no-brainer

- BTX scrubber operational, liquid bioBTX can be produced, integrated in total test facility in ECN's lab
- Attempts to increase BTX yield (5-10% in standard energy case) show that doubling is possible with little efforts. Also tripling has been reached.
- Translated to a bioSNG plant, this may give 25% bioSNG production costs reduction.

- ECN also develops SNG-processes with synergies: FT-SNG, fermentation-SNG, P2G-SNG, cryo-LNG-Methanol, ...

MORE INFORMATION

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