

## Syngas for Today and Biomethane 2G for Tomorrow as Opportunities to Green the Gas Market

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## **Digestion and gasification:** two different schemes for different biomass

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Humid » Biomass and non - ligneous





**Biological Pathway** Low Power range Low temperatures (35 – 55 °C) **Digestion** 

« Dry » Biomass and ligneous





Thermal Pathway Low to High Power range High temperatures (700 to >1500 °C)

**Combustion** 

Gasification

**Mature Technologies** Heat **CHP** 

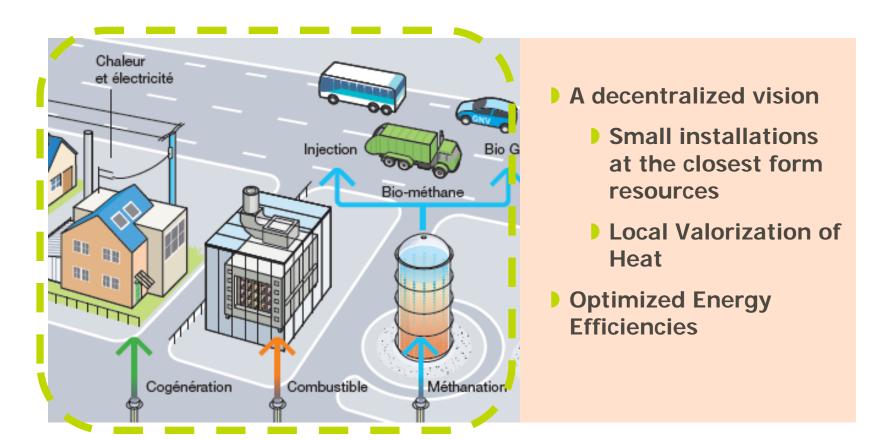
**Biomethane** 

**New Technologies:** Heat, CHP, Synthetic Natural Gas





## Gasification : Three targeted markets, but with different maturities





### Why gasifying wood instead of burn it?



CHP at Tournai (Belgium) 12 MW fuel, 0.3 MWe

#### CHP Case

- Enhance electricity production compare to conventional technology (HP Steam boiler + Steam Turbine): +30 to + 75%
- Keep independent power and heat production

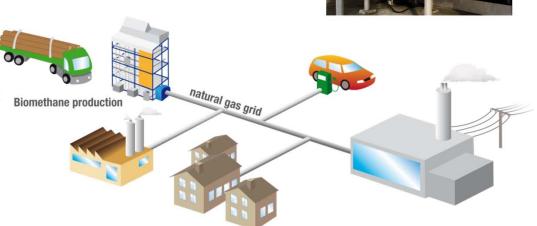


### Material Industry Case (glass, brick, metal, ...)

Unique renewable solution for Direct Heating Furnaces (NG or oil)

#### Tomorrow

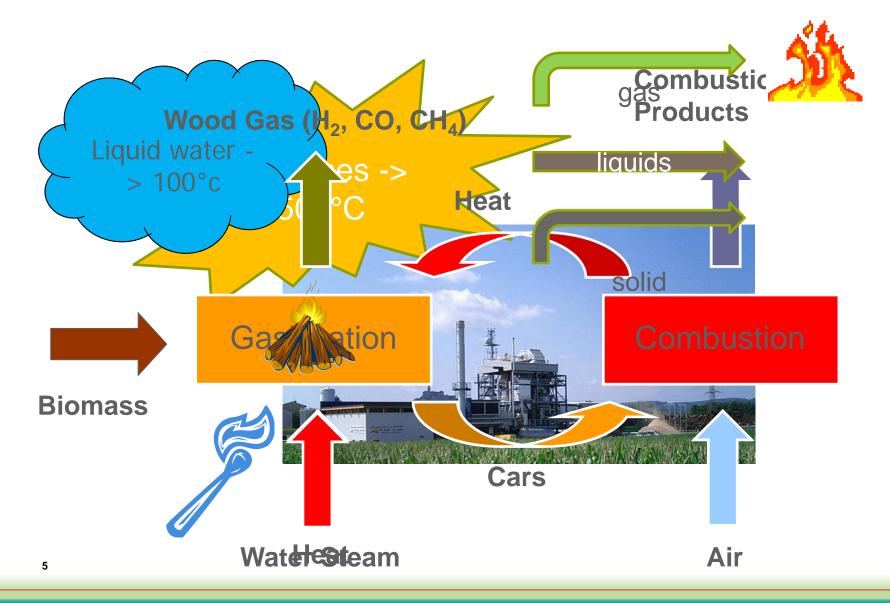
- make NG « out of wood »
- Decentralized Energy Plant Concept:
  - Fuel for vehicles
  - Grid gas
  - Electricity
  - Heat
  - Cooling





## ■ Wood gasification: How it works?

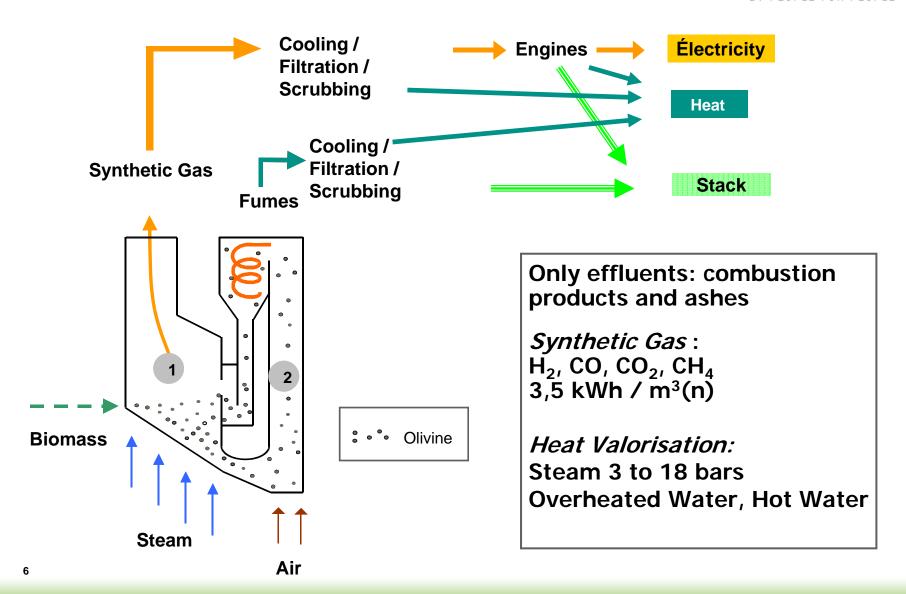






## REPOTEC Technology (FICFB): Main Characteristics







### Keys figures of a CHP Gasification Plant



- Power from engine(s) + 1 ORC from 2.5 to 10 MWe, 25 000 to 100 000 t wood / year
- Heat up to 50% from 4 MW to 16 MW
- Power and Heat Production during 20 years, 7 800 h / y





#### BioVive Project: from vineyard biomass to glass melting



#### Goals and stakes

- Development of a Biogas Syngas Production Technology for Glass Melting Furnaces,
- Saint Gobain Verralia coordinated Project, supported by the French National Research Agency.

#### Progress

- Xylowatt gasifier (1 MW fuel) delivered at GDF SUEZ
   Research Center (St Denis, near Paris)
- Connection to a 2 MW Combustion Test Cell (Glass Furnace model),
- Combustion Test in Glass Melting Furnace conditions (800°C preheated air, 1 200°C furnace tem.) with different fuel mix (natural and syngas)
- Gasifier to be transported newt year to St Gobain Oiry site to be hooked up to Glass Melting Furnace under operation.







## GAYA Project: Bio NG "made out of wood"







Coordinator



INSTITUT TECHNOLOGIQUE









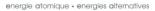
Demonstate at a pre-industrial scale the technical, economic, environmental and societal validity of gaseous biofuels by thermochemical production















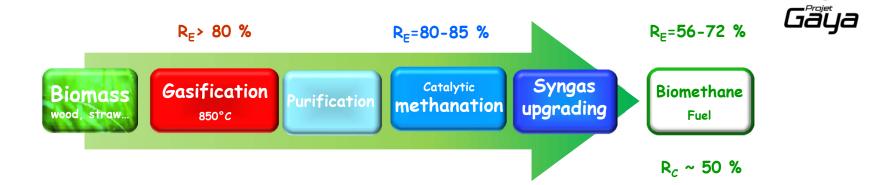




#### Bio-methane in few figures



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- Bio-methane, a technological choice in terms of local and sustainable biomass development
  - Very high energy yield: 60-70%
  - ▶ Local biomass recovery logic (smaller production units),
    - Reduced transport of the biomass, therefore reducing emissions
    - Enabling the local recovery of all heat produced by the process, which would be difficult for larger installations,
  - ▶ Easy and clean transport of bio-methane via the natural gas grid



2010

Jemo-platform

Validate at a preindustrial scale a portfolio of technological solutions



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2018 2010 2012 2014 2016 2020 2022 2024

Pre-industrial scale for biomethane production **Gaya Project** 

1<sup>st</sup> industrial plant

Industrialisation

2017

Industrialization

st

#### **Biomass**

Enlarge process boundaries Correlate biomass/syngas Study pre-treatment techniques Study interest of bio-refineries

A 47 M€project with 11 partners federating research & industry

and supported by ADEME

#### **Processes**

Technical support for other projects Modelling and simulation of the process Optimisation (efficiency, availability, costs) Optimisation of the syngas characteristics Purification: choice and improvement of the technology Definition of an innovative process





#### **Valorisation**

Definition and validation of an innovative process Separation process to fit specifications for injection

**Biomass** 

**Processes** 

**Syngas Purification** 

Methanation

Injection

#### **Transversal studies**

Life cycle analysis, energy integration, economic studies. Own GDF SUEZ R&D staff. Keeping up with processes, actors, market. Contact with universities.



## Demonstrator's arrangement



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## IGRC GAYA R&D Platform: site chosen near Lyon









Conclusions & perspectives



#### Conclusions & perspectives



#### Gasification, a new route for biomass energy applications:

- A complementary technology to direct combustion .
- A development of an *environmental-friendly industry* in line with a sustainable development approach.
- A local/regional approach to boost energy efficiency by minimising biomass transport

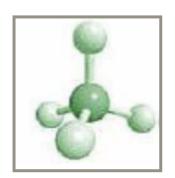
#### **Applications for today and tomorrow**:

- New biomass CHP plants with high average biomass to power conversion efficiency (30-34%, thanks to engine use) while keeping a high overall energy efficiency (72-80%).
- Direct firing of syngas into industrial thermal processes where no alternative exists to introduce a share of renewable energy into fuel mix (glass melting, direct drying, metal processing, brick industry, ...).
- Transformation of syngas into a bio-substitute of natural gas, with the same characteristics but *renewable*..





for your attention!



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