PIPING RENEWABLE ENERGY: UTILIZING METHANOGEN AND ORGANIC WASTE

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MOTIVATION

- **Storage of surplus renewable energies as chemical energy in form of methane for heating and fuel purposes and distribution via gas grid with a high storage capacity in Germany (514 TWh_{th})**
- **Reduction of fossil fuels usage and decarbonisation of the gas grid in terms of using renewable resources**

BIOLOGICAL METHANATION

- **Enzymatic catalysed process on average 10^5-10^7 faster compared to chemical reaction**
- **Reaction conditions at 60 °C and about 3 bar**
- **No catalyst poisoning by syngas pollutants (like H_2S, NH_3 or tar)**
- **Metabolism of CO already successfully proofed in a preliminary study**

THERMO-CHEMICAL CONVERSION

- **Conversion of wet biomass to biochar via a combined drying and carbonisation process**
- **Subsequent gasification at 1400 °C with oxygen**
- **Steam reformation with steam from the carbonisation process in order to maximise hydrogen content**

INNOVATIVE ASPECTS

- **Use as energy control storage device (electrolysis on demand) combined with thermochemical hydrogen generation for constant hydrogen feed**
- **Conversion of biomass (e.g. sewage sludge) to natural gas**
- **Conversion of CO via methanogenic metabolism**
- **Maximum efficiency by coupling methanation with thermochemical syngas**

OUTLOOK

- **Reduction of electric load grid on demand**
- **Decentralised thermochemical conversion and transportation of biochar to central gasification/methanation hubs with higher efficiency**
- **Sustainable energy supply for transportation, heating and electricity based on a renewable biogenic source**

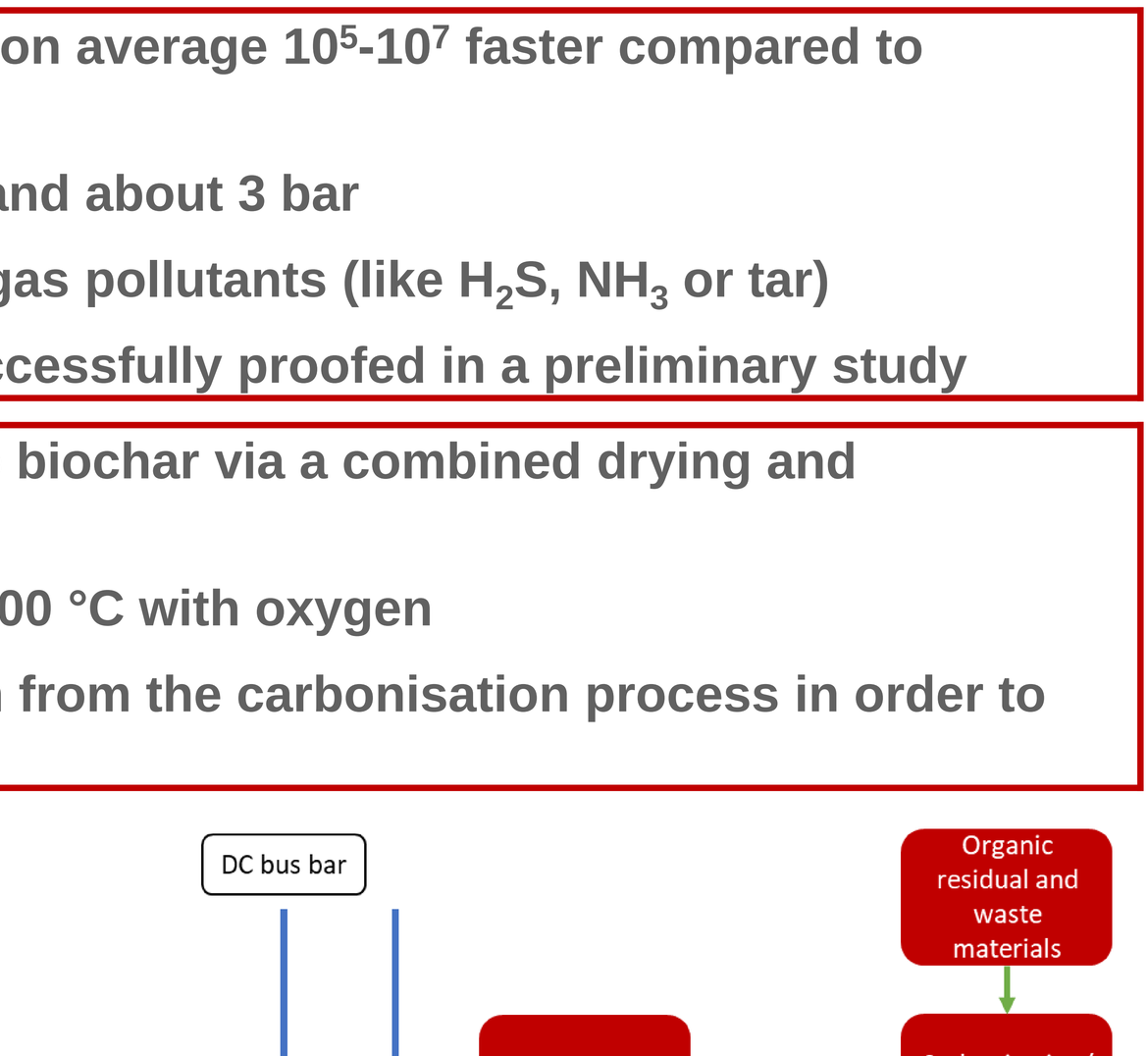

Figure 1: Concept of a novel hybrid energy storage system

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