



Biomass Low cost Advanced Zero Emission small-to-medium scale integrated gasifier - fuel cell CHP plant

H2020 RIA, 4.2 M€, 3/2019-2/2022, GA 815284

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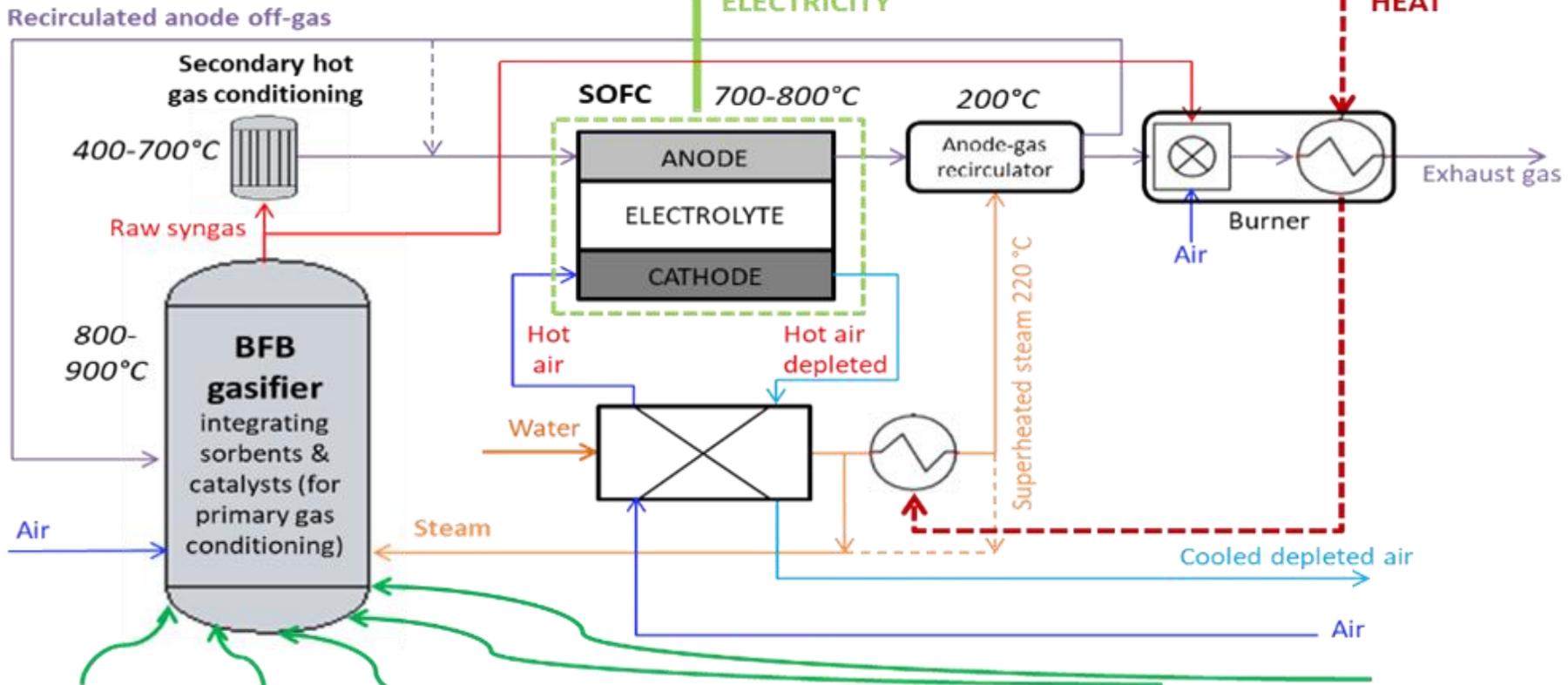
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- overall 90% (versus 65%, target SET-PLAN 75%) and electrical 50% (versus 25%, target SET-PLAN >30%) CHP efficiencies for small and medium scale biomass CHP
- near-zero gaseous and PM emissions as well as CAPEX below 4,000 €/kWe (versus the actual 5,000-10,000 €/kWe), and OPEX of ≈ 0.05 €/kWh (using low cost biomass, i.e. < 80 €/t, respect to the actual greater than 0.10 €/kWh)
- electricity production cost below 0.10 €/kWh (versus the actual 0.22 €/kWh, SET-PLAN target of 20% cost reduction by 2020, and 50% by 2030).



Flexible electricity supply and heat integration with agro, industrial or buildings



Low cost woody e.g. pruning waste

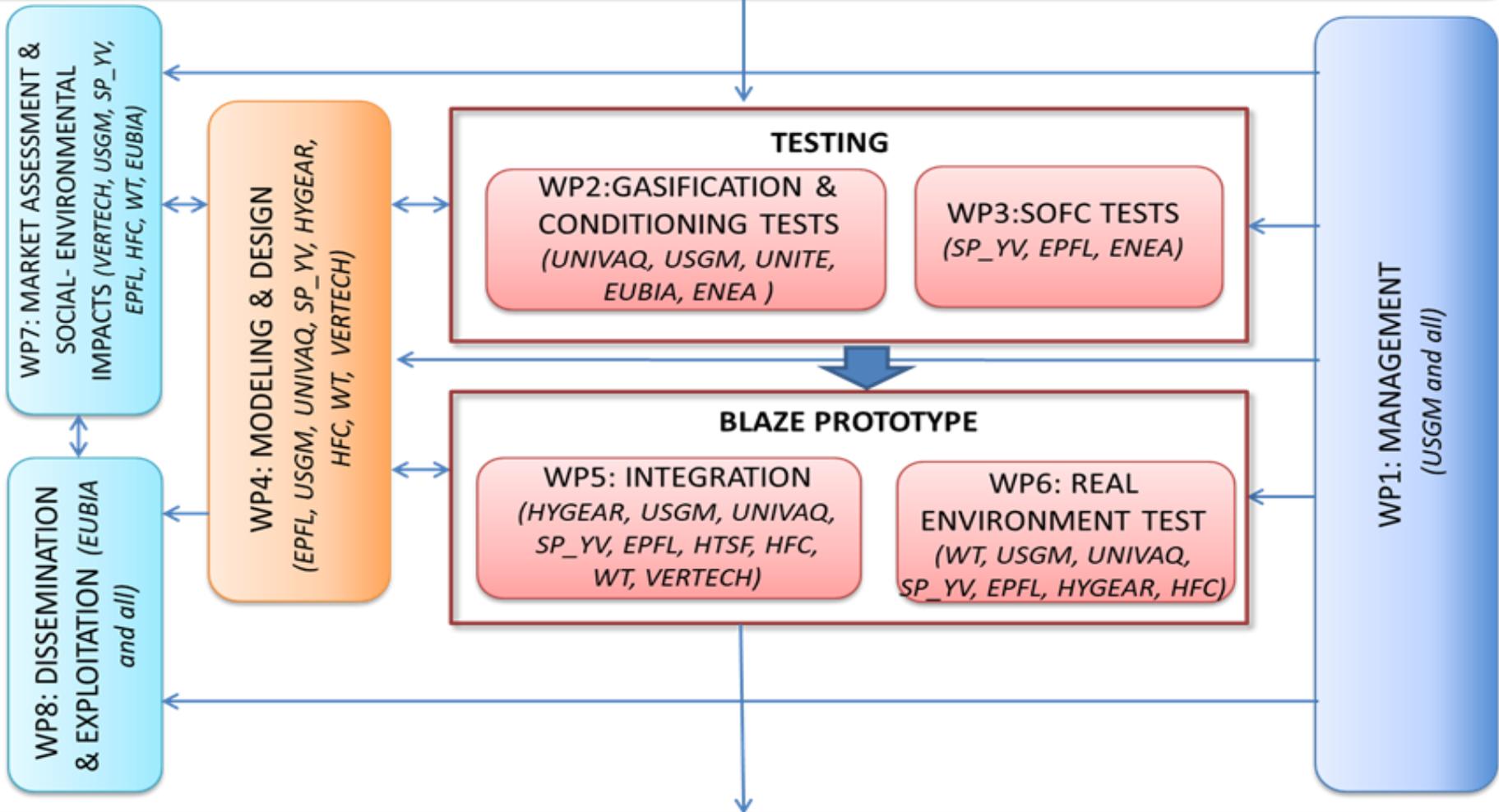
Industry waste (timber/food/distillation)

OFMSW

Digestate



Objectives: to develop Biomass, Low cost, Advanced and Zero Emission small-medium scale CHP plant «BLAZE»



Results: Breakthrough in the cost reduction and performance increase of biomass small and medium CHP



**Biomass Low cost Advanced Zero Emission
small-to-medium scale integrated gasifier
fuel cell combined heat and power plant**

1st Meeting ENEA Trisaia,
10/10/2019



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BLAZE PROJECT

- BLAZE is a Horizon 2020 project to develop an innovative, highly efficient and fuel-flexible technology for **combined heat and power from biomass**.
- The project demonstrates the use of an **integrated biomass gasifier and fuel cell CHP plant**, as a cost-effective way to produce renewable electricity and heat from residual biomass.
- The CHP system **integrates technologies** with proven performance and reliability: bubbling fluidised bed gasification, hot gas cleaning and conditioning, industrialised solid oxide fuel cells and off-gas recirculation.
- The project is in line with the SET-Plan Key Action 8 on renewable fuels and bioenergy and it **contributes to feed the innovation cycle**, laying the basis for the next generation of biomass technologies in the EU.

PARTNERS



UNIVERSITÀ
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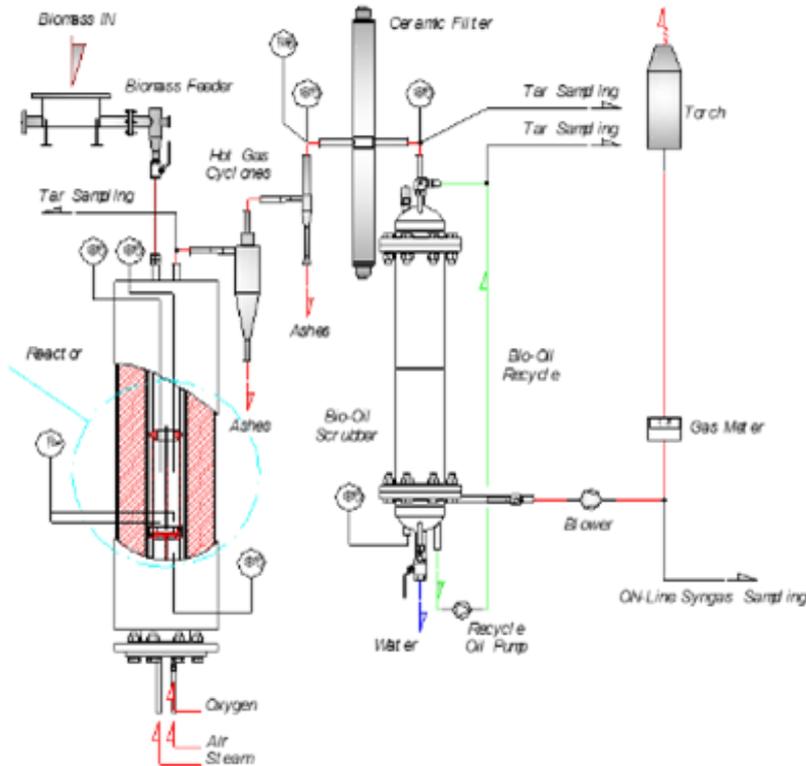


etaflorence 
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WP2: BIOMASS ASSESSMENT, GASIFICATION AND CONDITIONING

A wide spectrum of biomass feedstock available in Europe is assessed and tested for bio-syngas production and compatibility with solid oxide fuel cells, tar removal, and hot gas cleaning and conditioning.



scheme of the 3 kWth BFB plant

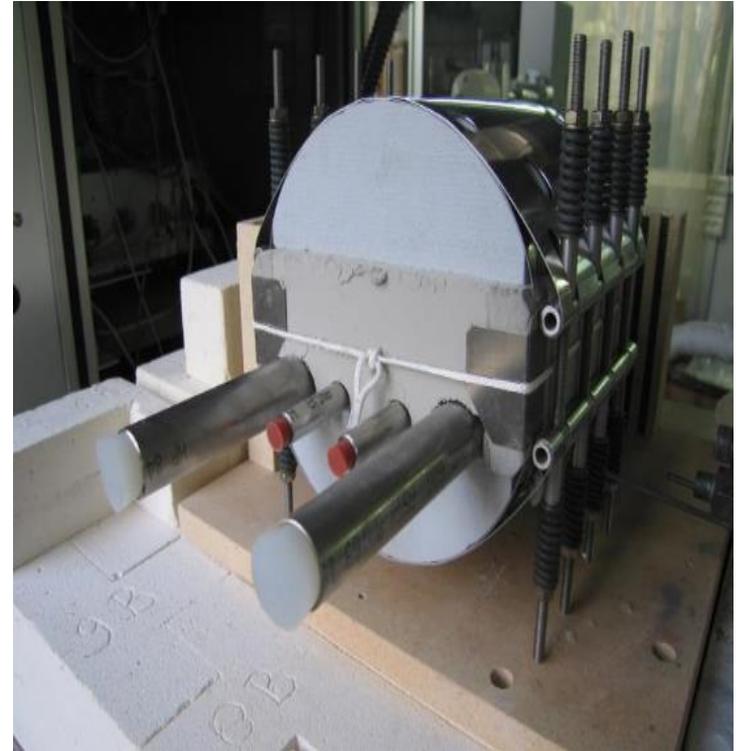
photo of the whole facility

WP3: SOLID OXIDE FUEL CELLS (SOFC) TESTS

The benchmarking of kinetics, performance, and durability of SOFC cells is carried out in order to optimize the cell's response to the characteristics of the bio-syngas obtained from different types of biomass.



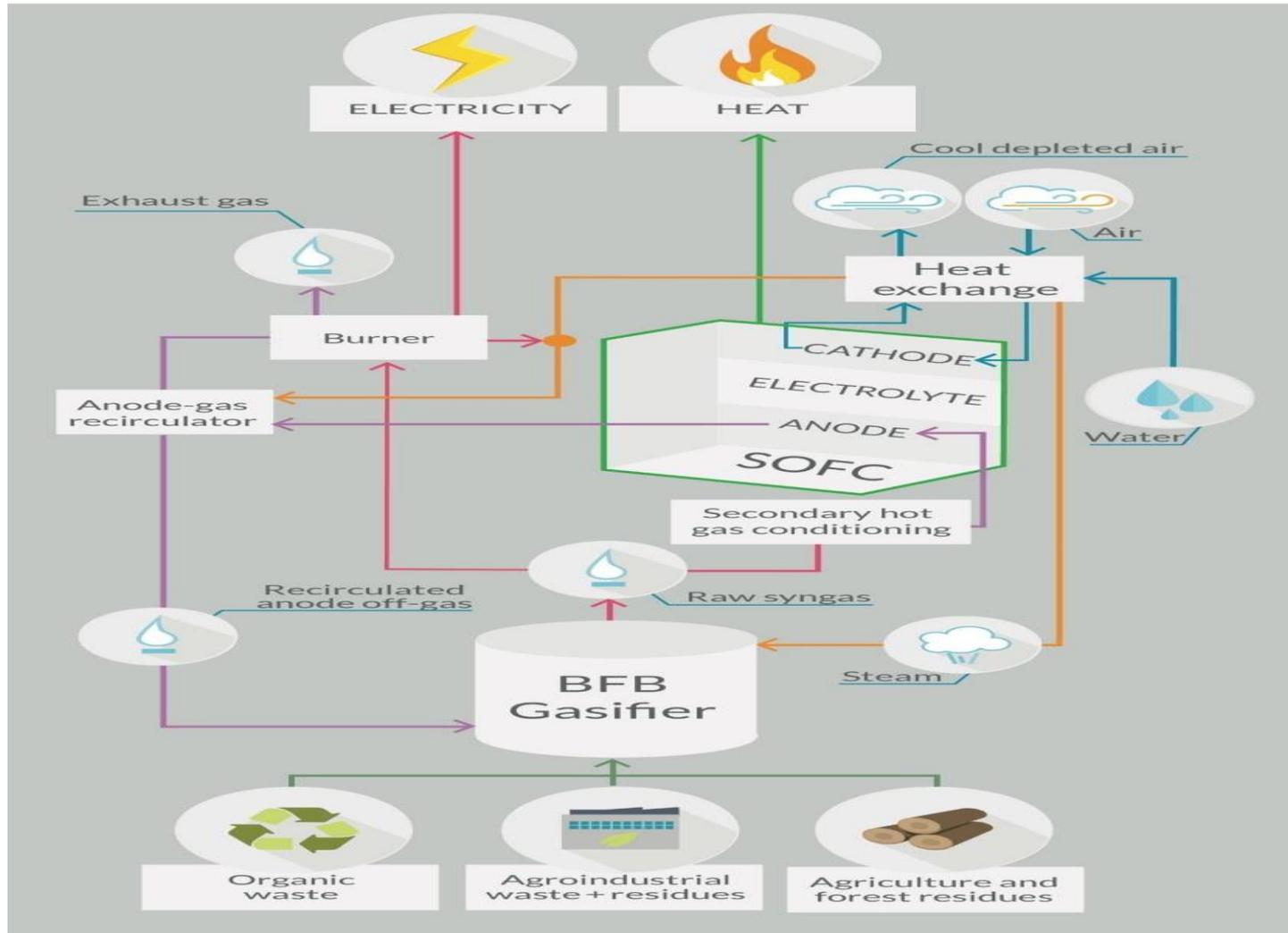
SOFC single cell test rig - gas and contaminants mixing stations (ENEA)



SOFC short stack tests

WP5: SYSTEM INTEGRATION

After the modeling and design the overall thermal system integration and the coupling of the gasifier with the cleaning system and the SOFC, is realized.



WP6: REAL ENVIRONMENT PERFORMANCE TESTS

The whole integrated system is tested in a real industrial environment and monitored for performance, risk and safety analysis.



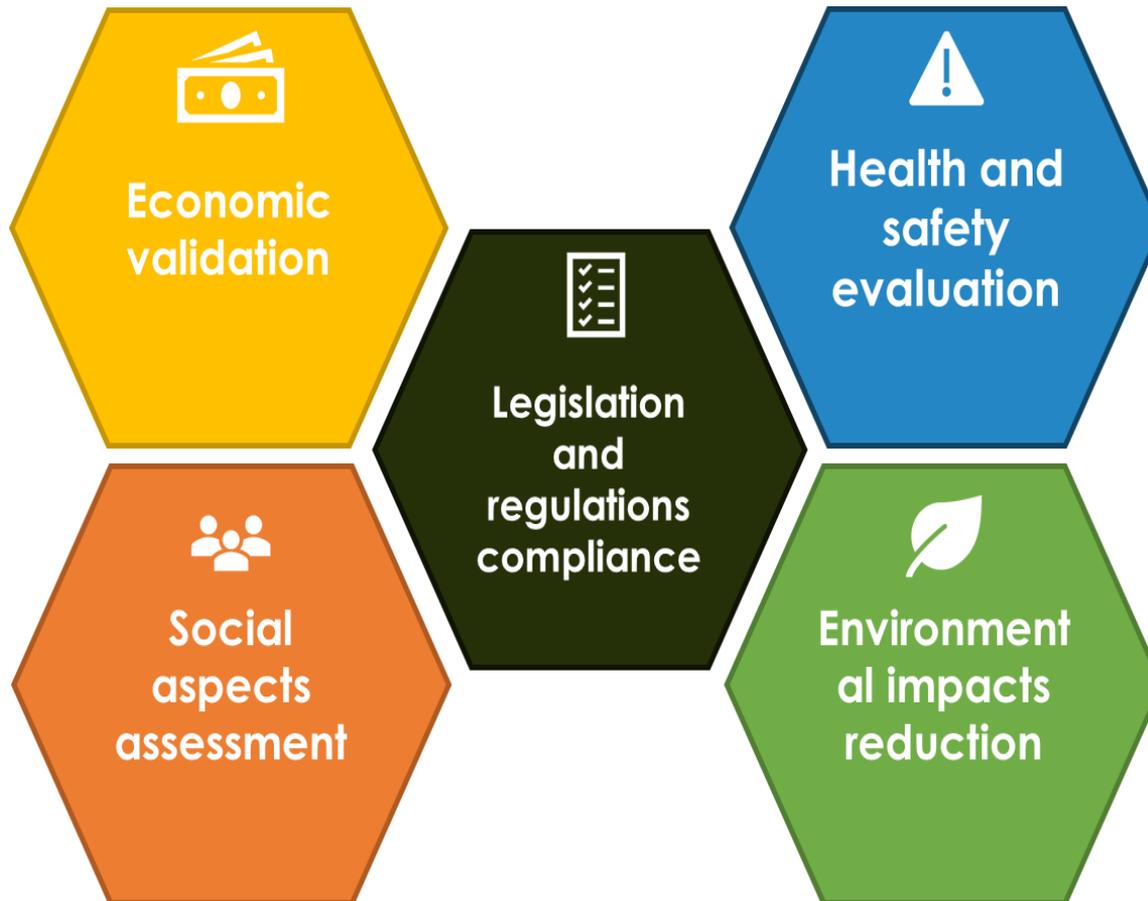
UNifHY 100 plant



SOFC Large Stack Module (25 kWe)

WP7: TECHNO-ECONOMIC, SOCIAL AND ENVIRONMENTAL ASSESSMENT

Feasibility studies are developed to quantify the impacts and to deploy the best alternatives for cost-efficient small and medium-scale biomass CHP, with increased resource efficiency and positive socio-economic impact.



WP8:DISSEMINATION COMMUNICATION AND EXPLOITATION OF RESULTS

A detailed market assessment and efficient business strategies for the successful implementation and replication of the BLAZE CHP system is carried out, as well as a plan to promote knowledge-sharing among the most relevant stakeholders, media and citizens.

Techno-economic evaluation

- Feasibility assessment of BLAZE technology.

Sustainability assessment

- Environmental.
- Economic.
- Social.

Legal and non-legal limitations and barriers

- Health and safety study.
- Legal limitations identification.
- Barriers of application identification.

EXPECTED RESULTS



CLEAN ENERGY FROM SMALL AND MEDIUM- SCALE DECENTRALIZED SYSTEMS

The BLAZE CHP system is applicable to capacities ranging from 25 kWe up to 0.1-5MWe.

The technology is able to operate with high efficiency at partial loads. The system represents a solution for the balancing of local grids and contributes to providing flexibility to the energy system.

EXPECTED RESULTS



COST COMPETITIVENESS

The thermal and chemical integration of the gasifier with the solid oxide fuel cell allows to achieve lower capital and installation costs than other biomass technologies in the same capacity range.

The bubbling fluidized bed gasifier is able to use a large variety of biomass types including many low-cost residues from forestry, agriculture and organic waste, thus keeping the operational costs low.

EXPECTED RESULTS



HIGH ENERGY EFFICIENCY – ZERO EMISSIONS

The system can achieve a net electric efficiency up to 50% and overall combined heat and power efficiency up to 90%.

The CO₂ balance of the system is neutral, and the flue gas emissions are equal to zero or negligible



THANKS FOR THE ATTENTION

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