EERA
European Energy Research Alliance
BIOENERGY

Workshop: Bioenergy towards 2030

EERA Bioenergy Joint Program, status and visions towards 2030

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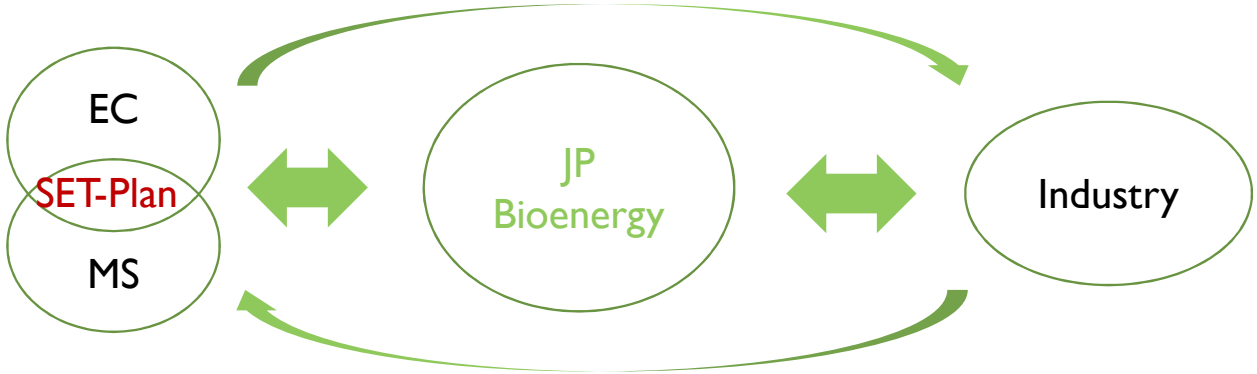
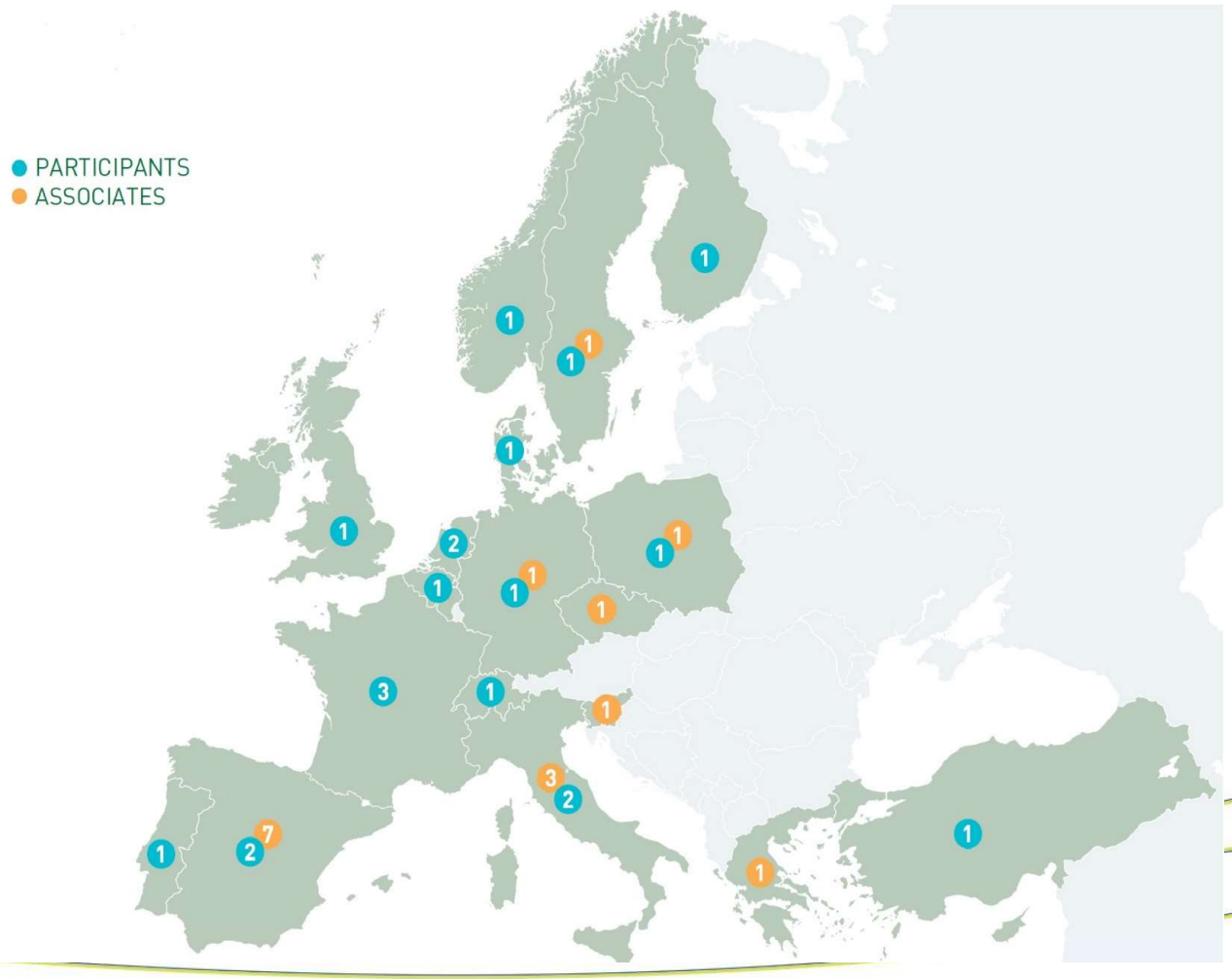
EERA JP Bioenergy – Objectives

- Overall objectives
  - ALIGN research activities at EERA JP bioenergy institutes to give a technical-scientific basis to further development of **advanced bioenergy** routes and to promote the possibilities for **joint** technology development, in order to contribute to accelerate the objectives of the **Set Plan**
  - ALIGN research activities at **EERA JP Bioenergy** institutions with **industrial priorities**
  - ALIGN national agendas in bioenergy research
  - ASSESS research priorities to accelerate the implementation of bioenergy in Europe, and particularly the Set Plan objectives



EERA JP Bioenergy – Partners

Number of participants: 36
Number of countries : 18



The present framework for bioenergy under the horizon 2030

- The Climate and Energy Policy Framework for the period from 2020 to 2030 has set the objectives to reach a 40 % reduction in GHG emissions by 2030 compared to 1990, a binding target of at least 27 % for the share of renewable energy in 2030 and a 27% energy efficiency indicative target.

- The development of RES is assumed as a first order strategy to comply with decarbonization objectives. Bioenergy is 67% of total RES production and will continue to be strategical to achieve energy production objectives with RES in the next decades.

- For electricity, heating and cooling, the proposal of RE Directive (RED II) establishes the threshold of minimum GHG savings compared to fossil fuels, that is fixed at 80% for installations starting after 2021, increasing up to 85% for installations after 2026. The advanced biofuels minimum share is set at 6.8% of total transport fuels consumption in 2030.

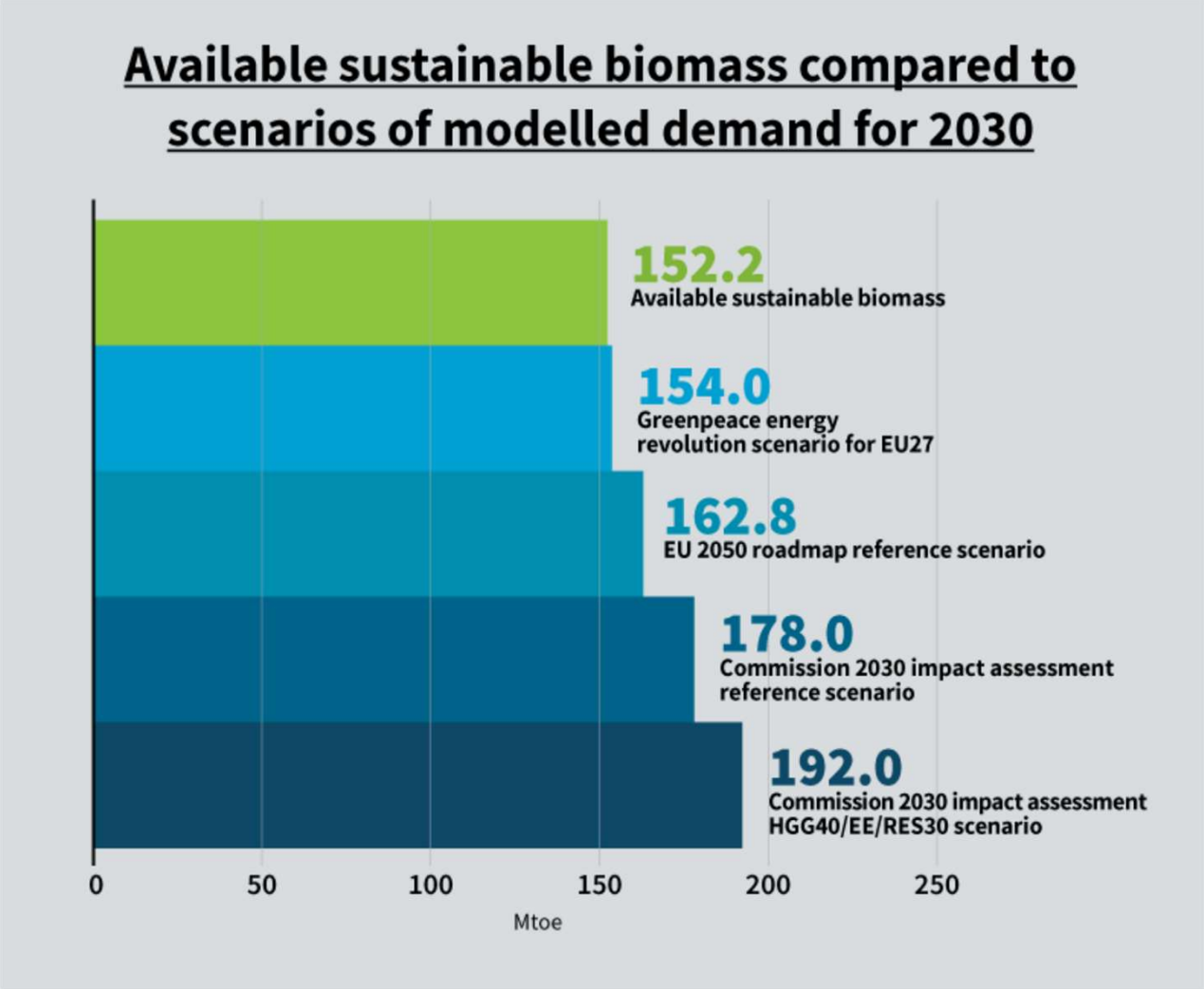
- In the DoI of the Set Plan for renewable fuels and bioenergy challenging objectives are stablished for increased efficiency and costs reduction of bioenergy, both, for advanced biofuels and heat and power production

Principles that should aim at the R&D&i to achieve 2030 objectives under present policy scenario

Integration is a capital strategy to optimise the cost efficiency and maximise the sustainable production of energy from biomass . This can be achieved by:

- Developing and demonstrating integrated biomass value chains rather than separate stages in a non well defined application context, in order to fit offer ad demand requirements.
- Integrating bioenergy technologies and processes to increase eficiency and reduce the costs of biomass conversion.
- In the context of an increasing role of RES to satisfy the energy demands, emphasizing the research on the synergies bioenergy may have with other RES and to cover specific energy demands.
- Integrating the bioenergy research into the bioeconomy and circular economy contexts, including the use of bioenergy to supply the biorefineries energy demands, the upgrading of biorefineries streams into advanced biofuels and recycling renewable carbon streams along the biomass value chains.
- Bringing stakeholders next to research and demo activities, to facilitate the further deployments.

Scenarios of expected biomass demand in the EU in 2030



Institute for European Environmental Policy (2014).

Challenges and main research priority activities to maximize the use of biomass resources potential for energy use, under sustainable conditions

- Increase biomass availability:

  - Intensify agricultural biomass production, integrating energy crops into feed production systems without compromising food production

  - Increase mobilization of under used resources: waste feedstock, forest and particularly agricultural residues, and mobilize new resources available: brush biomass.

  - Production of biomass in marginal lands.

  - In long term, develop low energy, cost efficient and reliable blue biomass production and pretreatment systems.

- Minimize the net carbon used for the production of agricultural biomass. Development of low input practises and incorporation of carbon to soil utilizing perennial crops and biofertilizers (digestates, biocharcoal…)

- Evaluate the impact of non food crops biomass production in representative farms context. Modeling and optimization of supply scenarios under real life conditions.

Under utilized biomass resources: agricultural residues

Sustainable annual potential in the EU: 20-60 Mtoe (50-150 Mt d.m.).

Woody residues (vineyard, olive tree and fruit prunings) annual potential: 10Mtoe (25Mt d.m.)

Woody residues are almost unused today (less than 10%)

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD
Ciemat
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New forest biomass resources: brushes

Brush on fire

<u>Data for the EU:</u>

Brushes surface: 20Mha (about 45% located in Spain)

Estimated annual biomass potential: 5-7 Mtoe (12-16 MMg d.m)

Additional benefits: reduce forest risks, avoiding associated soil carbon release, biomass can be used in a context of biorefinery, for the obtention of bioproducts.

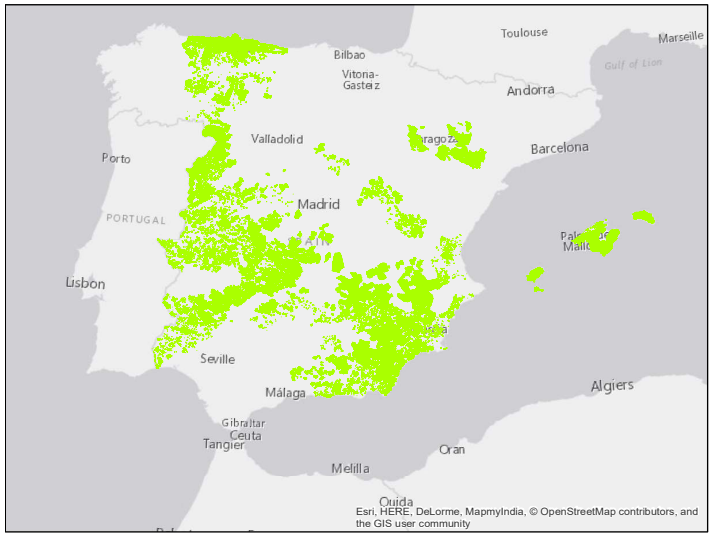
Demonstrative mechanized collection of brush biomass in Spain (Enerbioscrub Life + Project)

Production of biomass on marginal lands

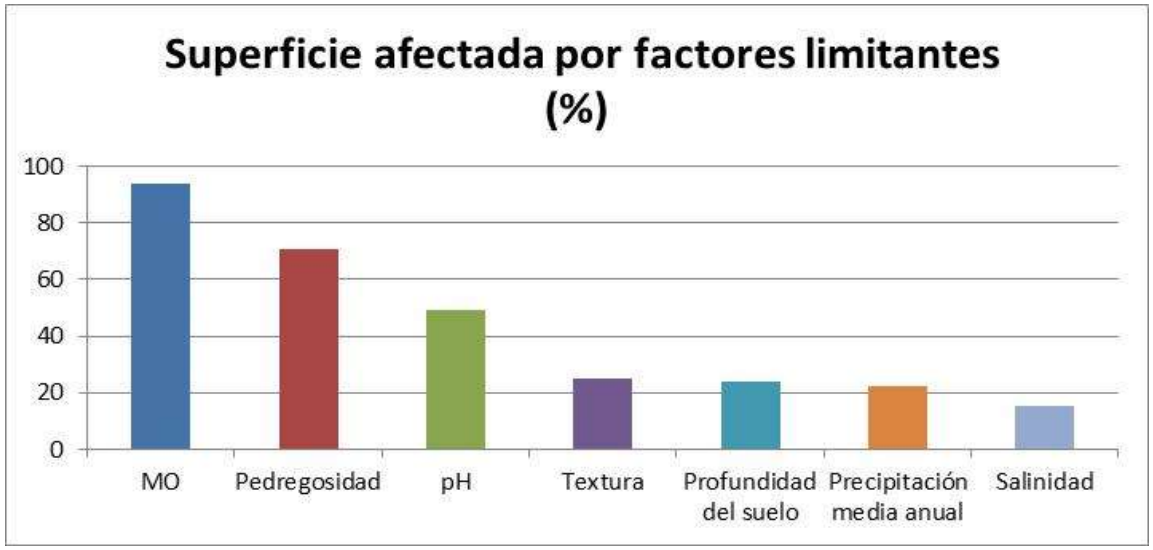
- More than 2Mha of land (11.3% of cultivated land) is non profitable for cereal production (marginal land) in Spain. This is about 11.3% of the national cultivated surface.

- Modeled potential of *C. cardunculus* on marginal lands in Spain: 3-15MMg. Occupation of land: 72%

Marginal lands in Spain



Source: MAPAMA statistics (2006-2017)



OM<2 %; stoniness>20 %; 6<pH>7,5; Soil texture, Soil depth>100 cm; Rainfall annual>400 mm; Salinity>4dS/m

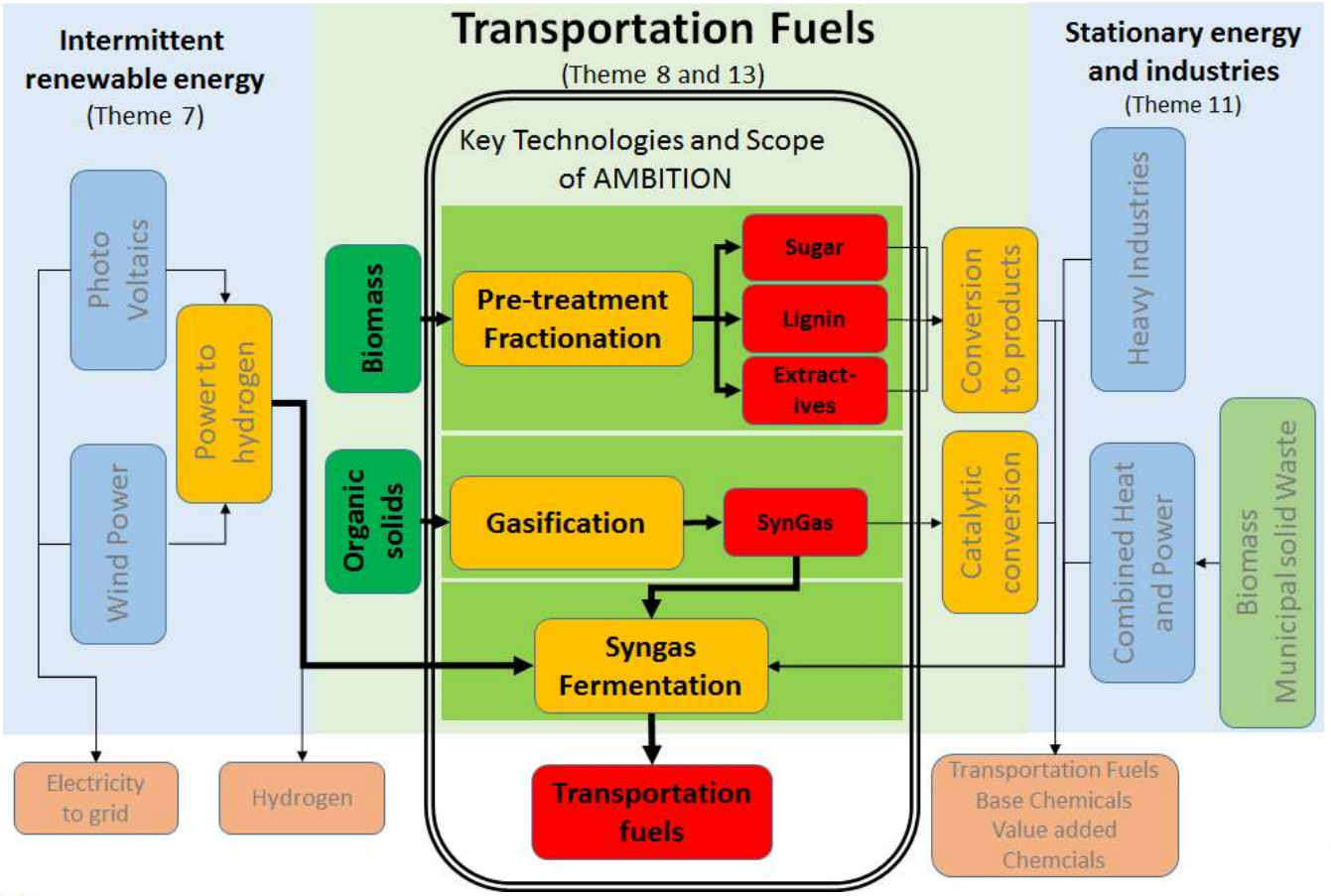
Challenges and research priorities to increase efficiency, reliability and reduce the costs and carbon use of biomass conversion technologies

- Increase the flexibility of biomass supply to bioenergy technologies, in particular low grade feedstocks/residual streams.
- Production of low cost intermediate bioenergy carriers (torrefied biomass, optimised biomass/waste blends…) to reduce logistic and/or improve the raw biomass performance in energy conversion.
- To develop novel cost effective technologies and devices and improve performance of the existing ones to increase the efficiency and reliability of the production processes for advanced biofuels, heat and power, including the incorporation of integrative solutions and optimising the use of side carbon streams.
- Novel developments to reduce particles and NOx emissions of small and medium size biomass combustion devices.
- Integration of bioenergy into biorefineries (based on bioproducts) to boost economic viability and decarbonize the biorefineries production:

  -Cost efficient technologies for upgrading biorefinery waste streams into biofuels for transport and intermediate carriers for heat and power production .

  - Use of biofuels (external or wastes) to supply the biorefineries energy demands (e.g integrated CHP plants)
- Integration in hybrid RES systems. E.g in CHCP individual installations and small grids, to increase efficiency, reduce costs and stabilise the energy production, fitting it to the variable demand or in longer term, developing renewable power to gas and liquid processes.
- Development of smart integrated concepts to improve performance of bioenergy instalations.

AMBITION Project
Advanced biofuel production with energy system integration



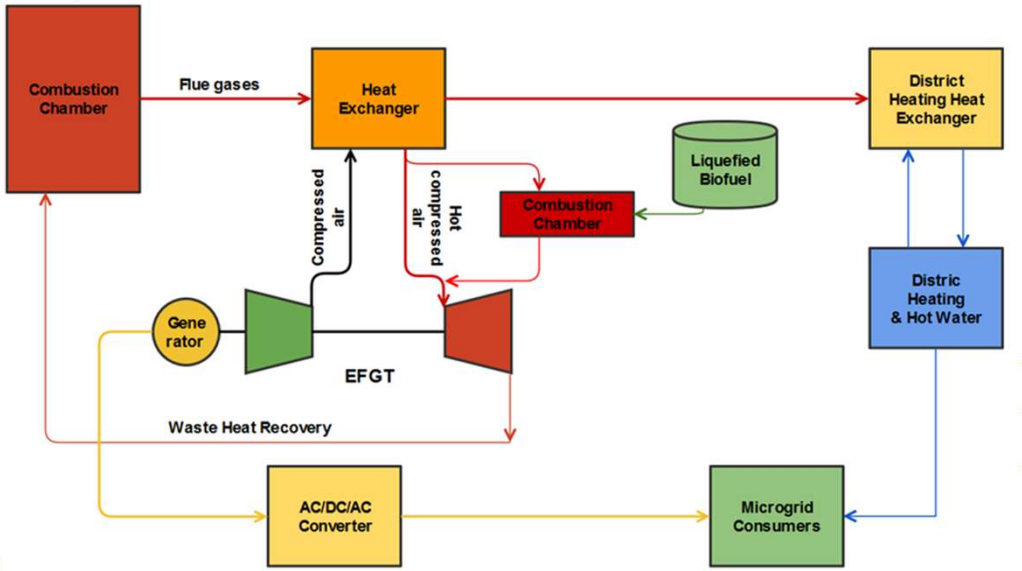
Integration of biofuels in small hybrid RES CHP installations

Needs of technological development:

a/ Smart control systems to optimize the biomass integration in the hybrid systems, including the energy storage, and the instantaneous CHP demand, both in isolated systems as well as in small and micro grids.

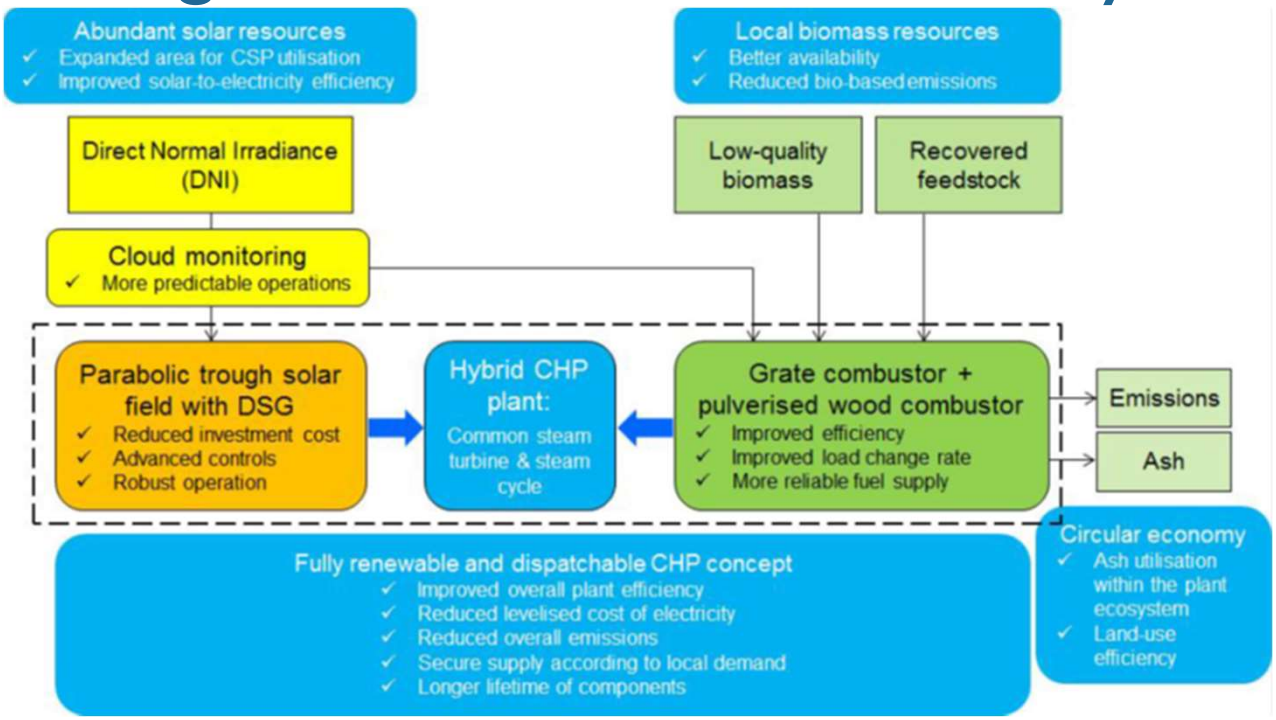
b/ Development of biomass systems of low emission levels and fast response to the variable energy demand. E.gs.

- EFGT (EFGMT) with secondary chamber feeded with liquid biofuels for fast response to the power demand requirements.
- Development of advanced clean (low NOx and particles) combustion technologies (e.g. MILD combustion, gasifier boiler concept…)



Scheme showing the integration of an advanced EFMGT in a CHP microgrid

Integration of biofuels use in hybrid CSP plants



Scheme of hybrid biomass CSP plant (parabolic CSP technology)

Biomass-CSP hybrid demo plant in Borges (Spain)

R&D+i needs (from the biomass side):

- Mapping the areas with solar and biomass fields suitable for the viable implementation of CSP plants.
- Development of biomass boilers operating at the steam conditions of solar fields and of fast response to demand variations.

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THANK YOU

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