

## **Steam indirectly heated gasification for biofuels productions from residual biomass**

There is no renewable energy technology with higher commercial potential (around 678 Mt/y of EU residual biomass, i.e. around 2000 TWh that can produce around 30% of total electricity or 40% of total transport EU final energy consumptions); lower environmental impacts and greenhouse gases emissions (up to CO<sub>2</sub> negative); better resource efficiency, social acceptance and cross-fertilisation with many sectors and, potentially, lower cost than the use of residual waste biomass and renewable electricity excess via integration of HTC (hydro thermal cracking), SEG (Sorption Enhanced Gasification), HGC (Hot Gas conditioning), CCSU (Carbon Capture Storage and Use) and P2G (Power to gas) for advanced biofuel production. Indeed, as long as there is life there will be residual biomass but it is needed a pretreatment in order to allow the use of different biomass residues with large availability and low cost (producing solid intermediate bioenergy carriers with 5 €/MWh cost) including high humidity and ash content residual biomass and waste. Via steam gasification intensified with CO<sub>2</sub> capture process (SEG) it is possible to halve the cost of capture process (40 €/t vs 90 €/t) avoiding bed agglomeration and sorbents deactivation phenomena and producing a syngas with hydrogen content more than double of the steam gasification (i.e. 90% versus 40%), and a flue gas with 90% CO<sub>2</sub> developing high quality gaseous intermediate bioenergy carriers with adjustable H<sub>2</sub>/CO ratio, i.e. 2 for methanol production) with 10 €/MWh cost.