Transition pathways towards a sustainable and competitive production of energy commodities and materials

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- Energy efficiency improved by 8% through integration of a heat recovery steam cycle in a biomass-to-hydrogen gasification process.

- Biomass gasification for production of fuels and/or chemicals, e.g. SNG, MeOH, H2.

- Changes in utility system enable 61 MW of technically feasible savings in hot utility consumption at a petrochemical cluster, i.e. 50% of the current boiler utility load.

- Reduction of CO2 emissions by 85%

- Process integration can supply up to 60% of the heat demand for MEA process.

- Other CO2 capture techniques also evaluated to identify possible better process integration.

- Identification of process changes with Pinch Analysis tools.

- Site-wide improvements, utility network optimization by means of Total Site Analysis.

- Reduction of the plant primary energy need.

- Replace fossil feedstock by renewables and maximize resource utilisation, both in stand-alone and integrated biorefinery plants.

- Process design and simulation of various concepts.

- Reduction of the environmental footprint through capture and storage of CO2 emissions.

- Identification of promising CCS clusters.

- Integration with existing plants or with biorefinery concepts.

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Performance criteria

Ranking of pathways according to different criteria: energy/exergy efficiency, economic performance, carbon footprint.

Extension of the system boundaries from process unit to regional or global scale.

Process evaluation

Fossil fuels & electricity

Renewables

Industrial process

Energy services & CO2 emissions

Emissions

Products

Waste

Primary energy input

Energy market scenarios

Generation of consistent future energy market scenarios and investigation of profitability with respect to different time perspectives (from today to about 2050).

Use of a Life Cycle perspective for evaluating environmental consequences.

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