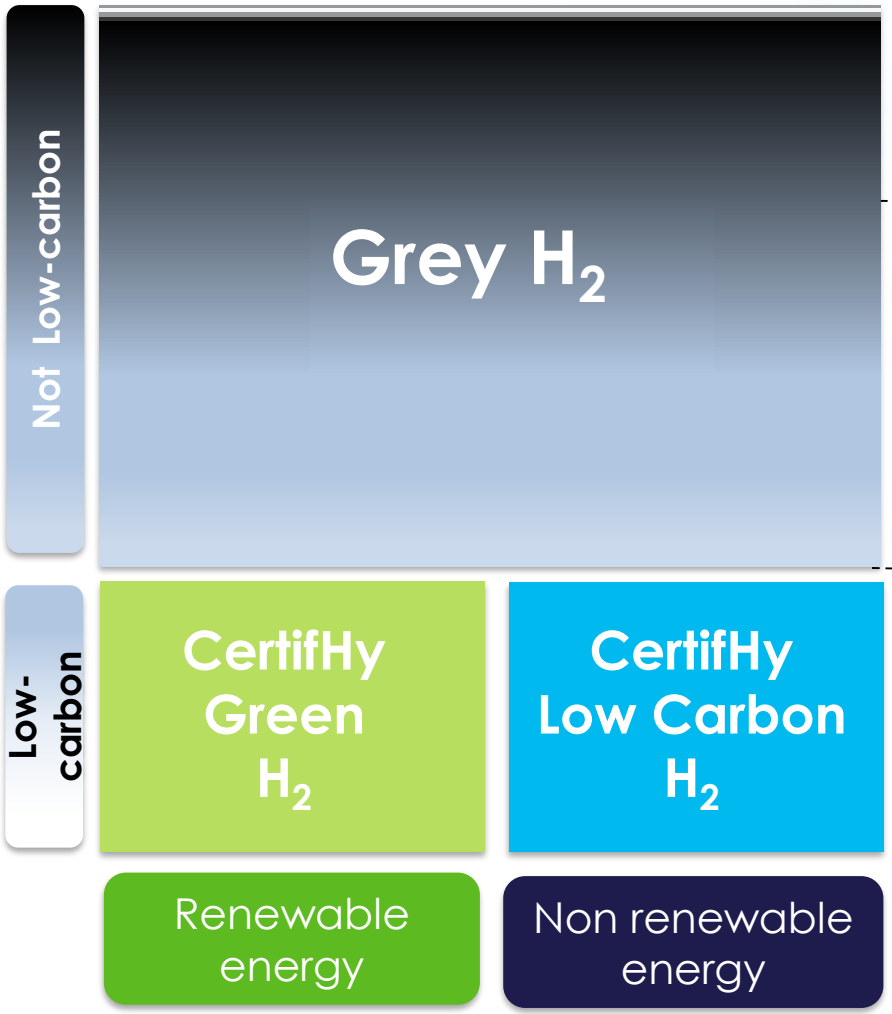
CertifHy- Developing a European Framework for the generation of guarantees of origin for green hydrogen

Definition of Green Hydrogen, outcome & scope LCA analysis

Project supported by the FCH JU

The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement n° 633107 - Duration: 24 months (Nov 1st 2014 to October 30th 2016)

As outcome of the consultation process, CertifHy addresses both Renewables and GHG emission targets of hydrogen users



Benchmark emissions intensity threshold (= 91 g $CO_{2\ eq}/MJ_{H2}$)*

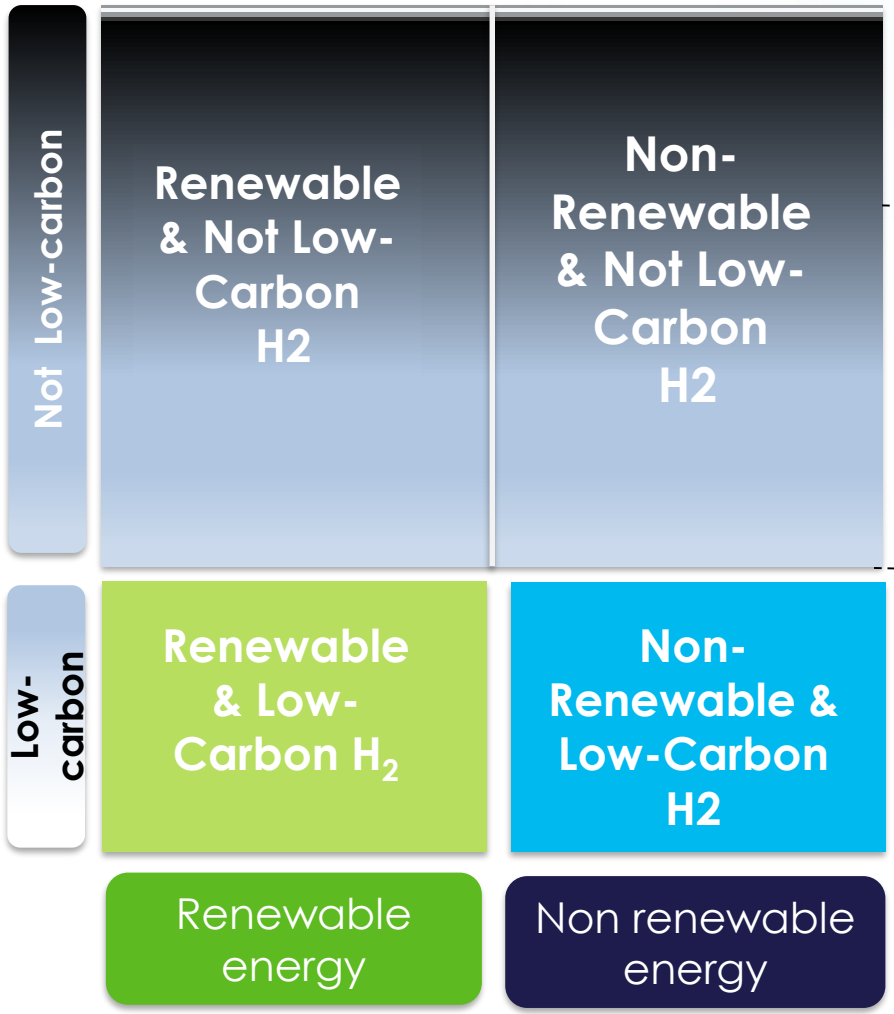
- 60% GHG**

Low-carbon threshold (= 36.4 g $CO_{2\ eq}/MJ_{H2}$)

* Best Available Technology = Natural gas steam methane reforming,
= >95% of the provided merchant hydrogen market

** cfr RED reduction requirement for biofuels in 2018

"Low carbon" defined as a 60% reduction compared to a BAT emission benchmark



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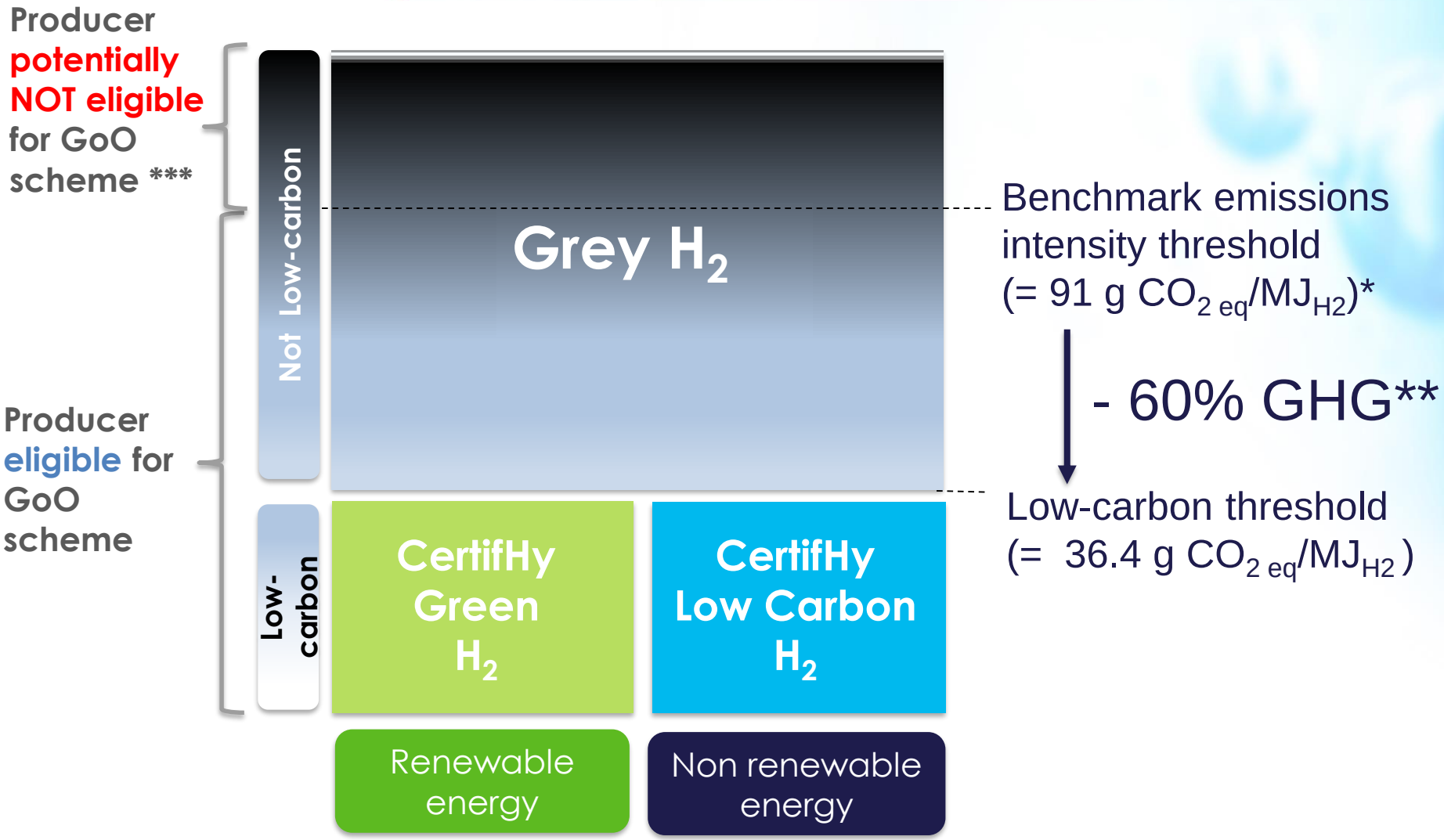
Excessively high GHG emissions *may* exclude a plant from participating to the CertifHy GoO scheme



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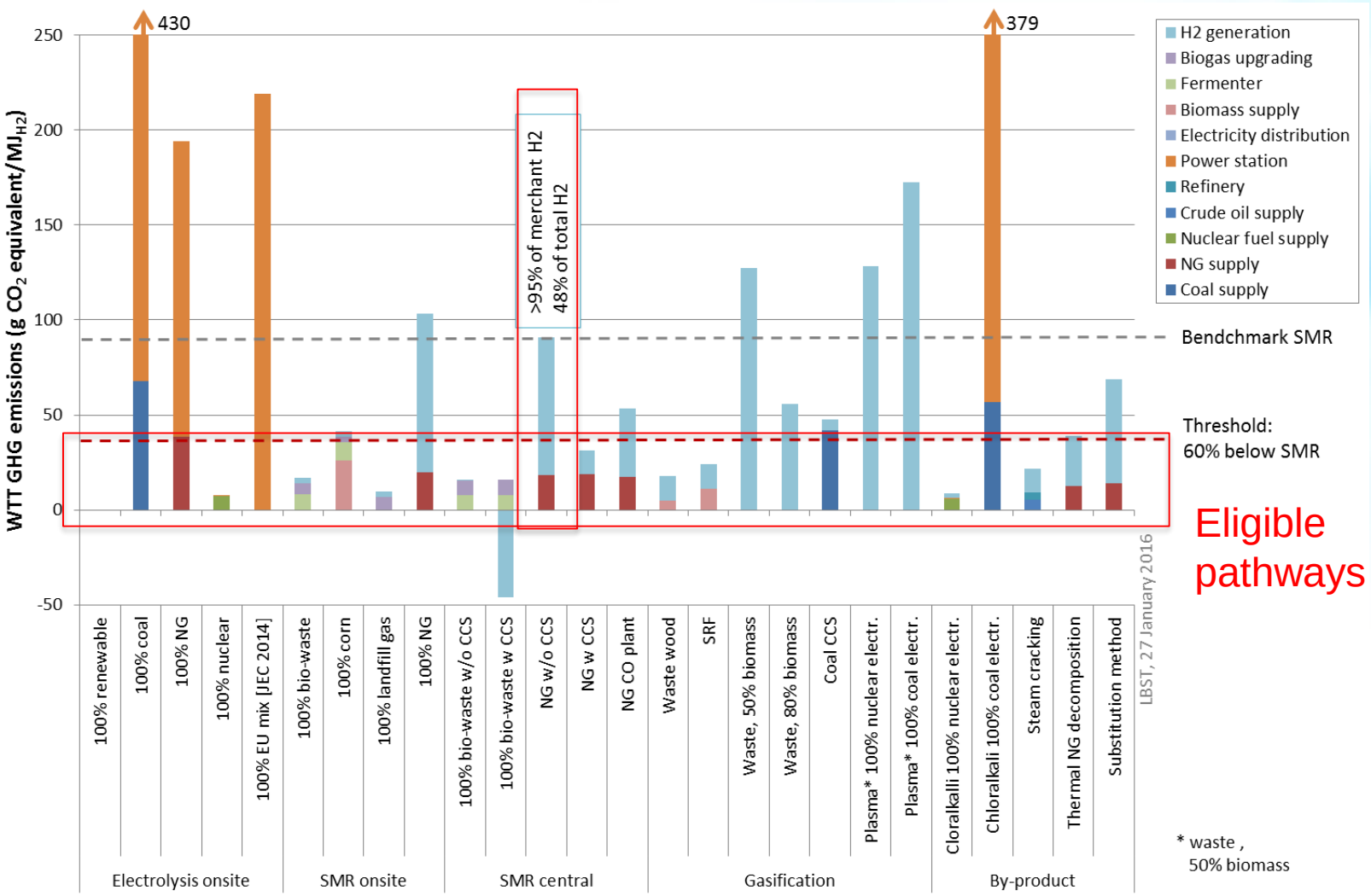
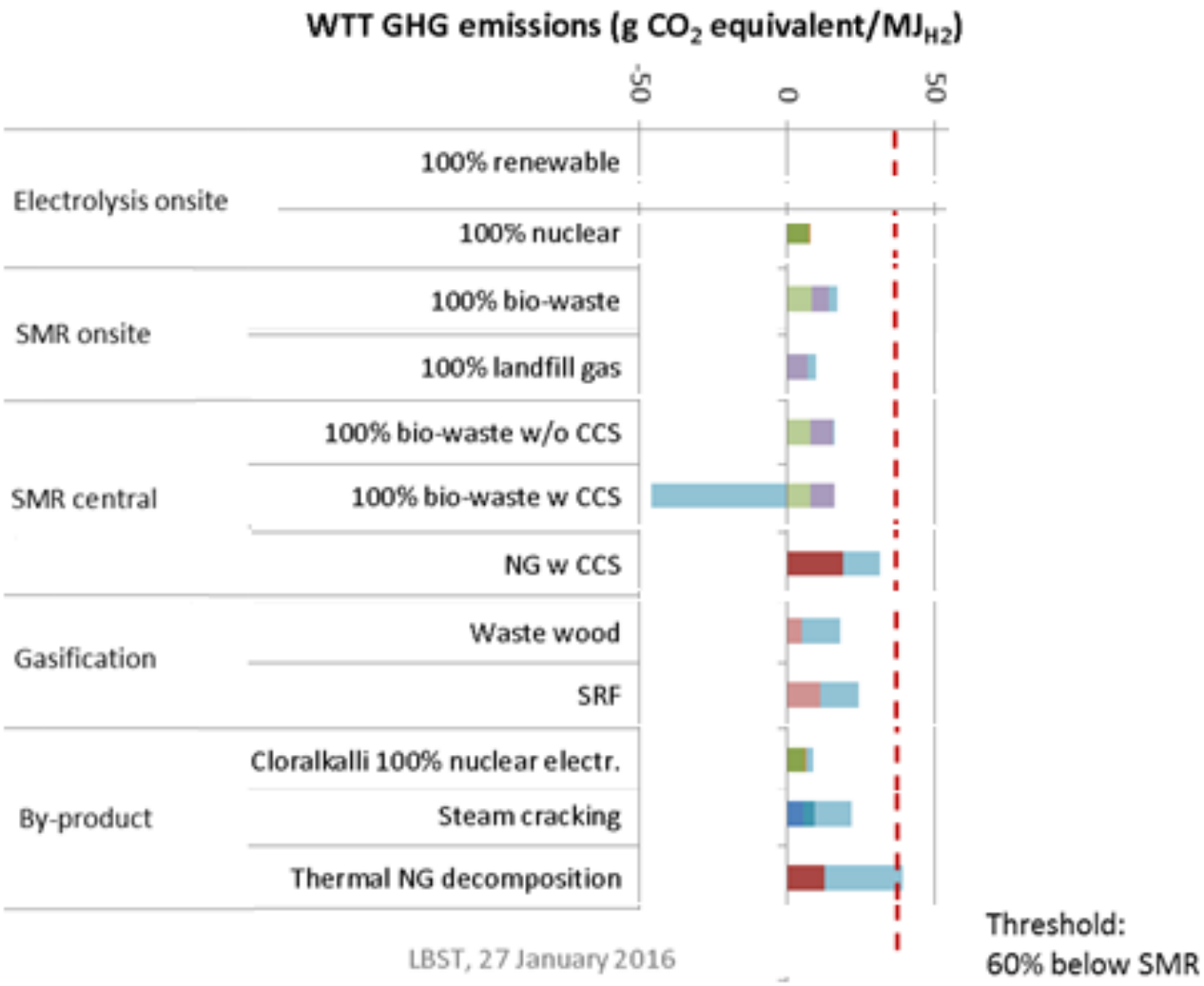
** cfr RED reduction requirement for biofuels in 2018

The low carbon benchmark has been set at an ambitious level



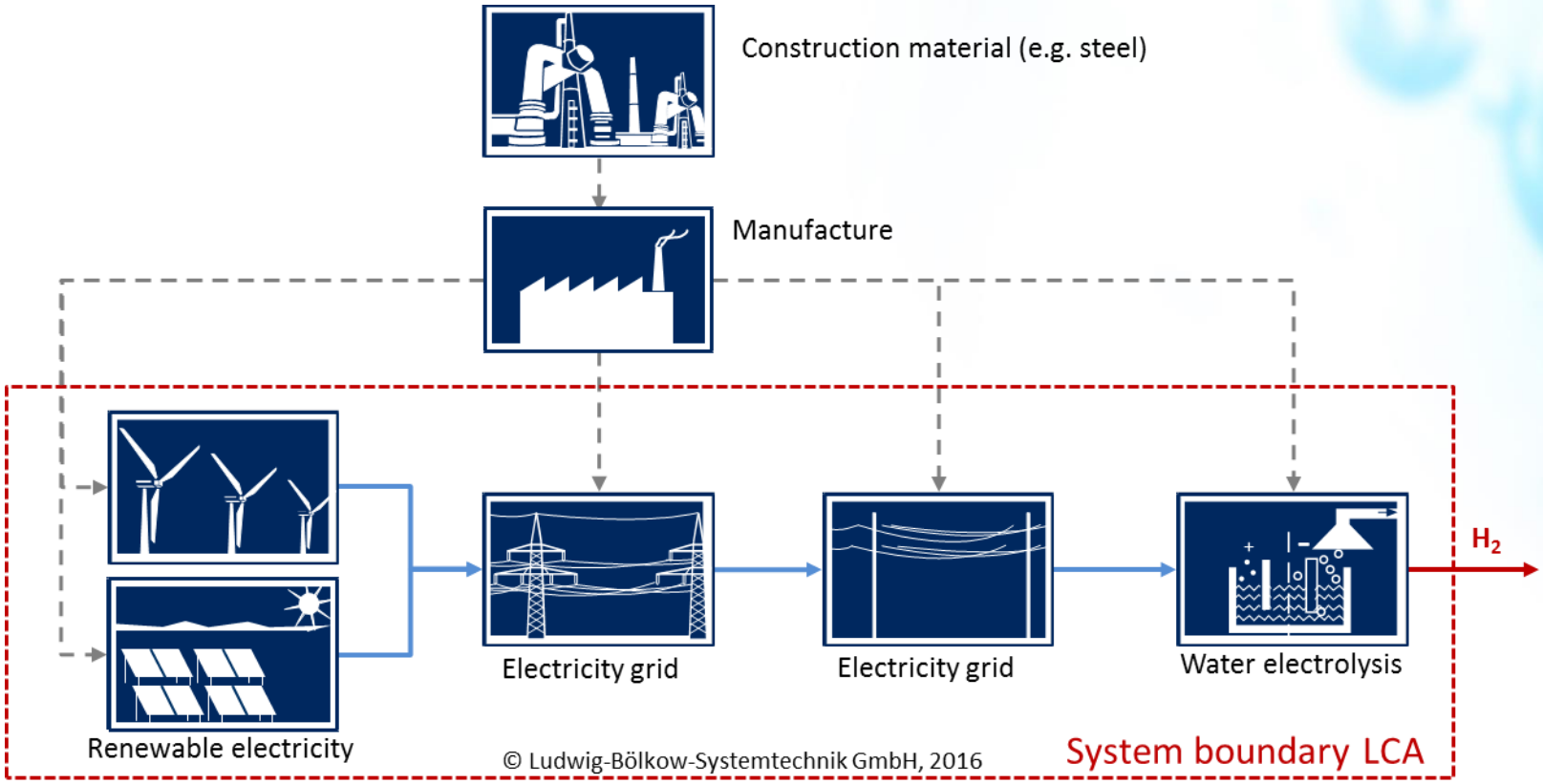
A CO2 audit will tell you what's low carbon and what's not



LCA analysis: calculation

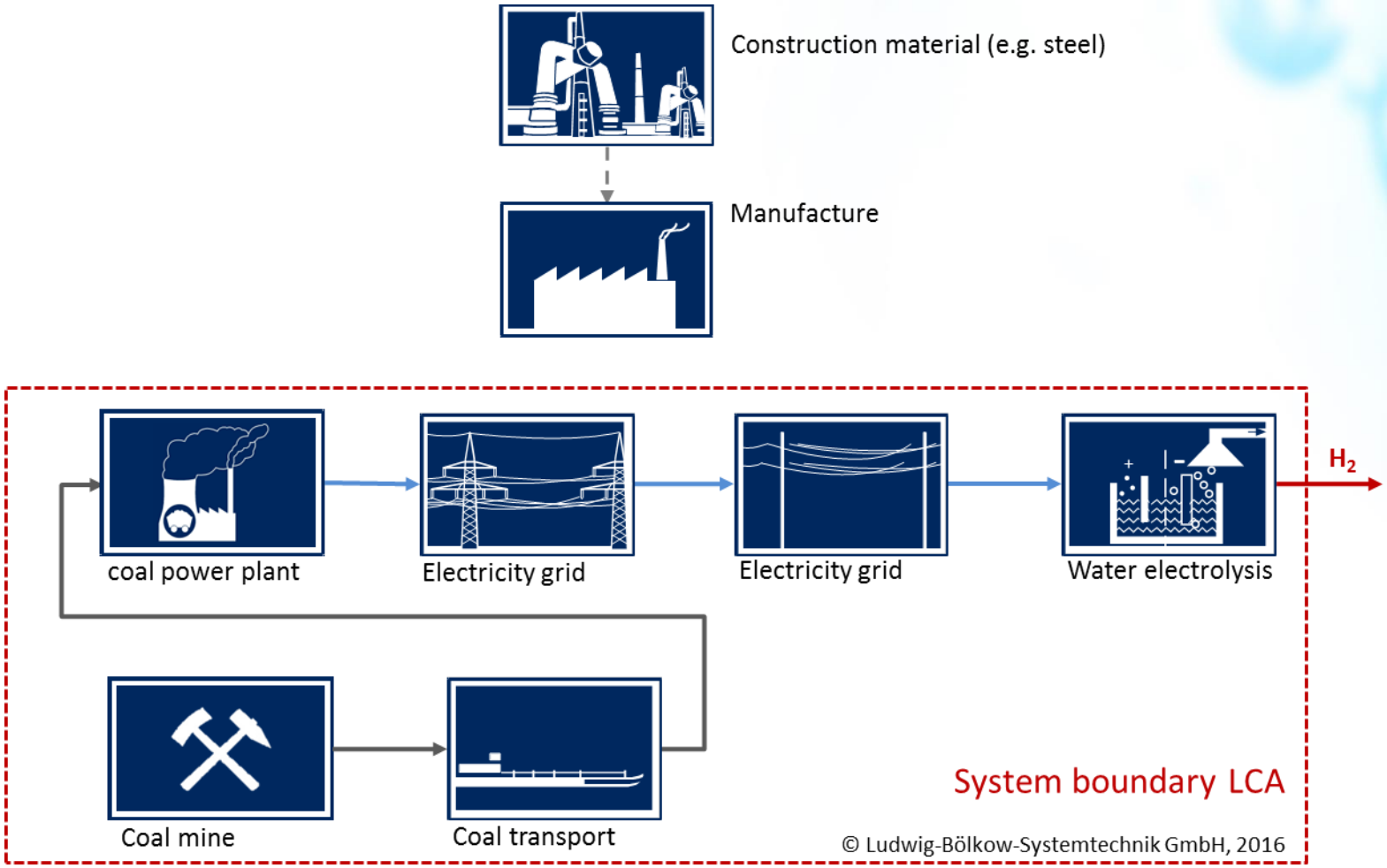
- The methodology of the RED and FQD are used for balancing GHG emissions; where necessary, methodological approaches were adjusted and used, notably for by-product hydrogen
- The methodology used for calculating the GHG balances is that of the RED and the FQD
- A “cradle-to-gate” approach is used
- GHG emissions from CO_2, CH_4 and N_2O are considered for the calculations; values for gross warming potential are taken from IPCC’s fifth Assessment Report
- Only CO_2 generated by the combustion of fossil fuels is considered; combustion of biomass is CO_2-neutral
- Energy requirements and GHG emissions resulting from the construction and decommissioning of manufacturing plants, installations and applications (e.g. vehicles) consuming the hydrogen are not considered here

Electrolysis onsite: 100% renewable

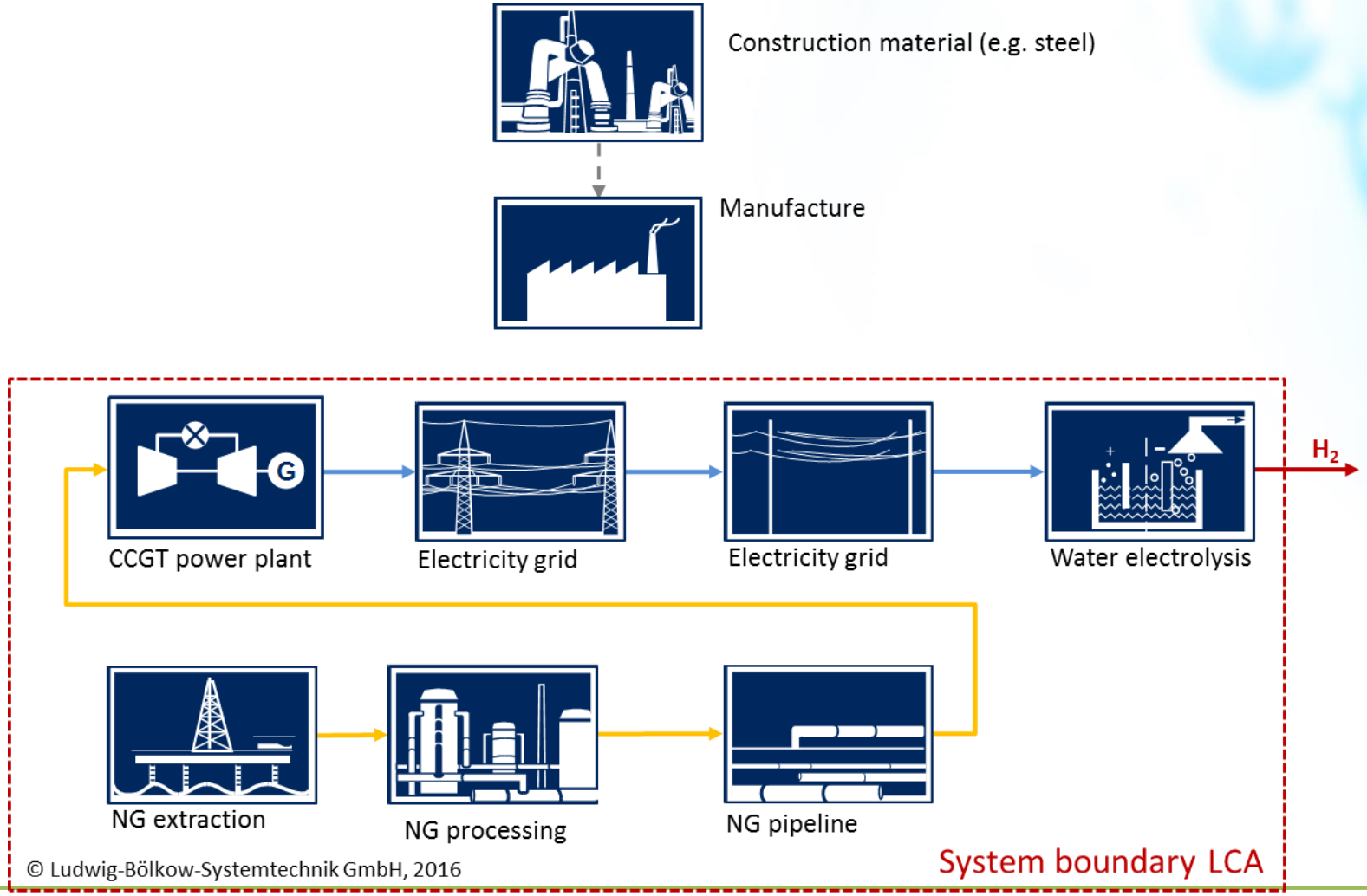


Supply of construction material and manufacture of power stations, electricity transmission lines, fuel production plants, and vehicles not taken into account

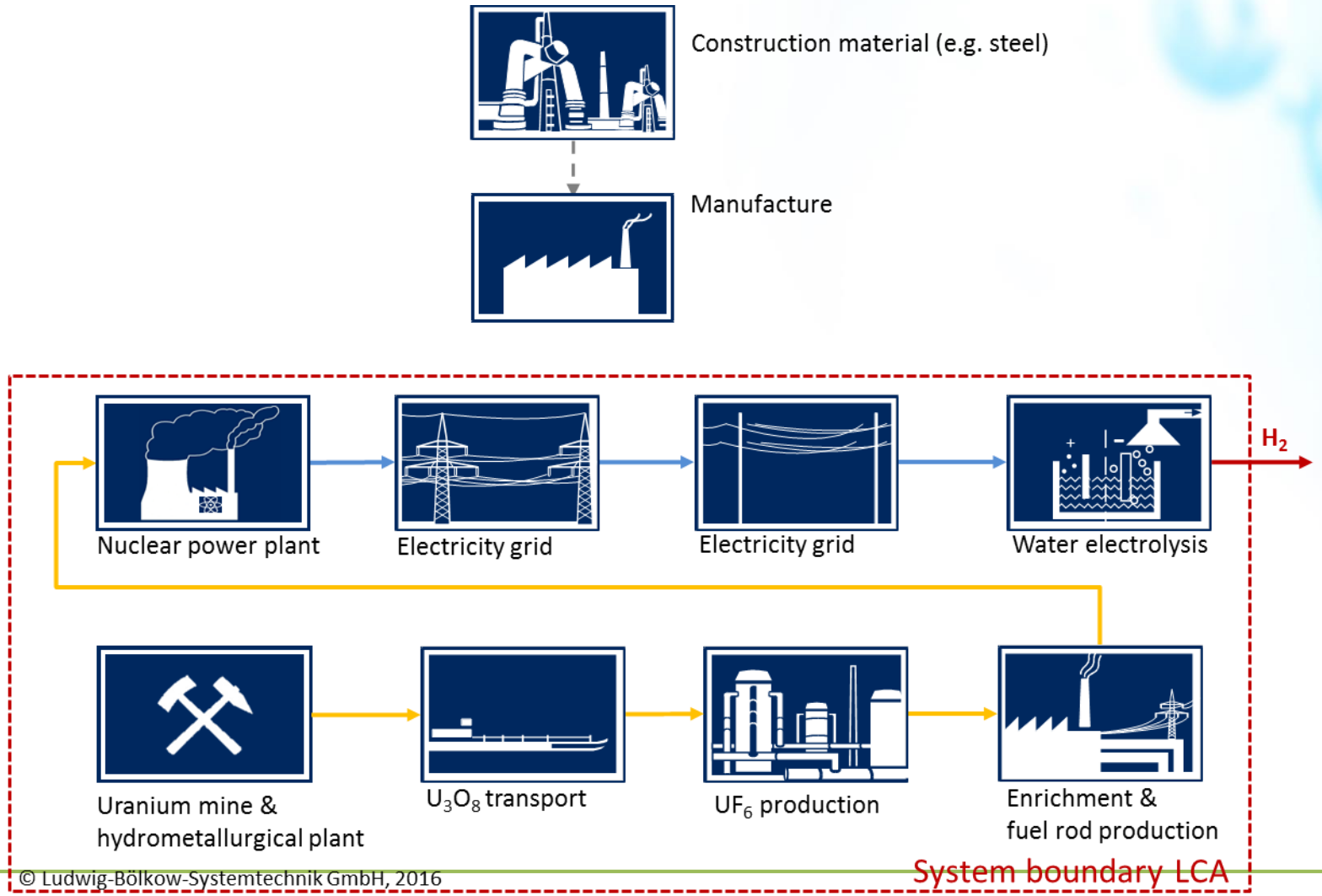
Electrolysis onsite: 100% coal



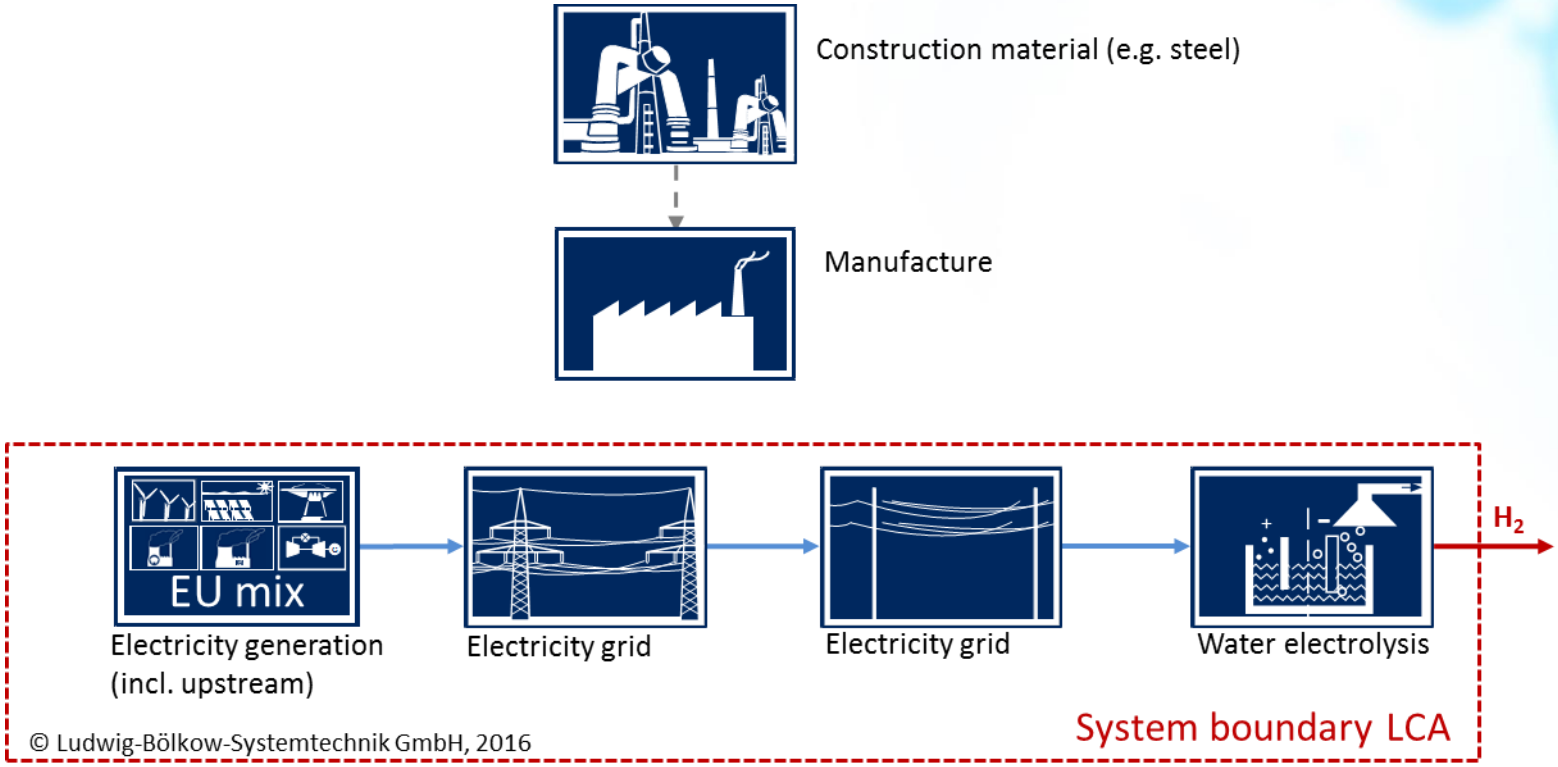
Electrolysis onsite: 100% natural gas



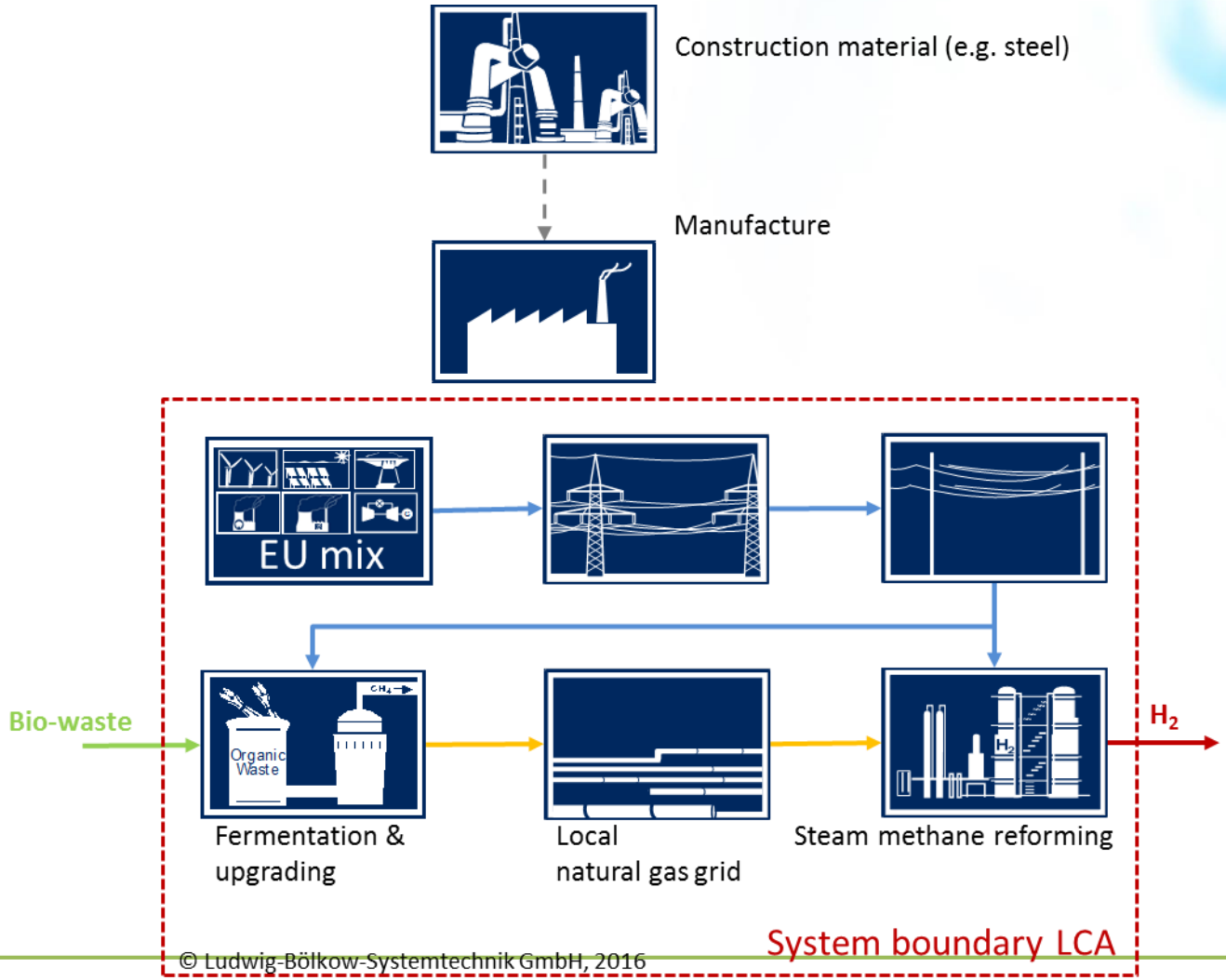
Electrolysis onsite: 100% nuclear



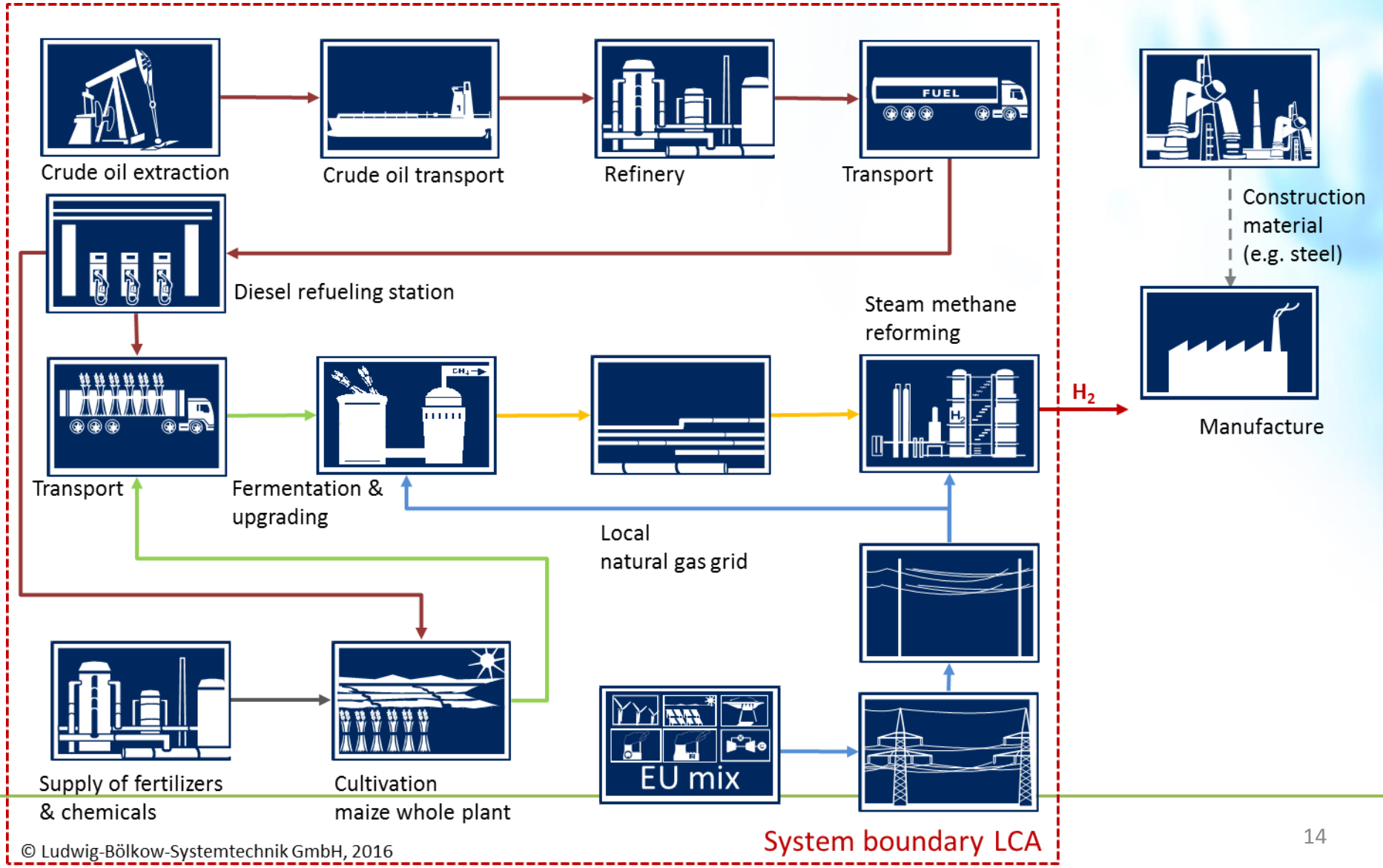
Electrolysis onsite: 100% EU mix



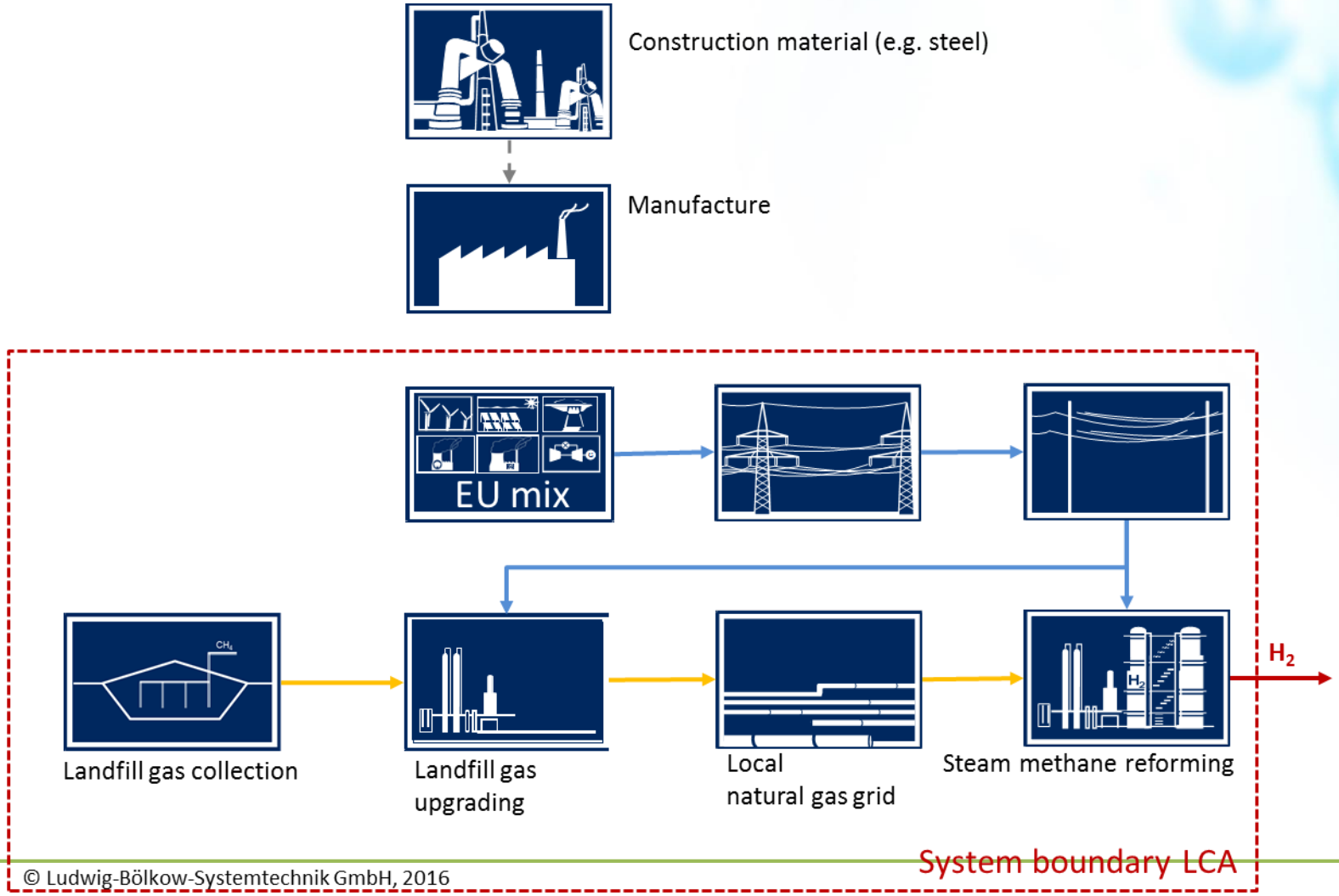
SMR onsite: 100% bio-waste



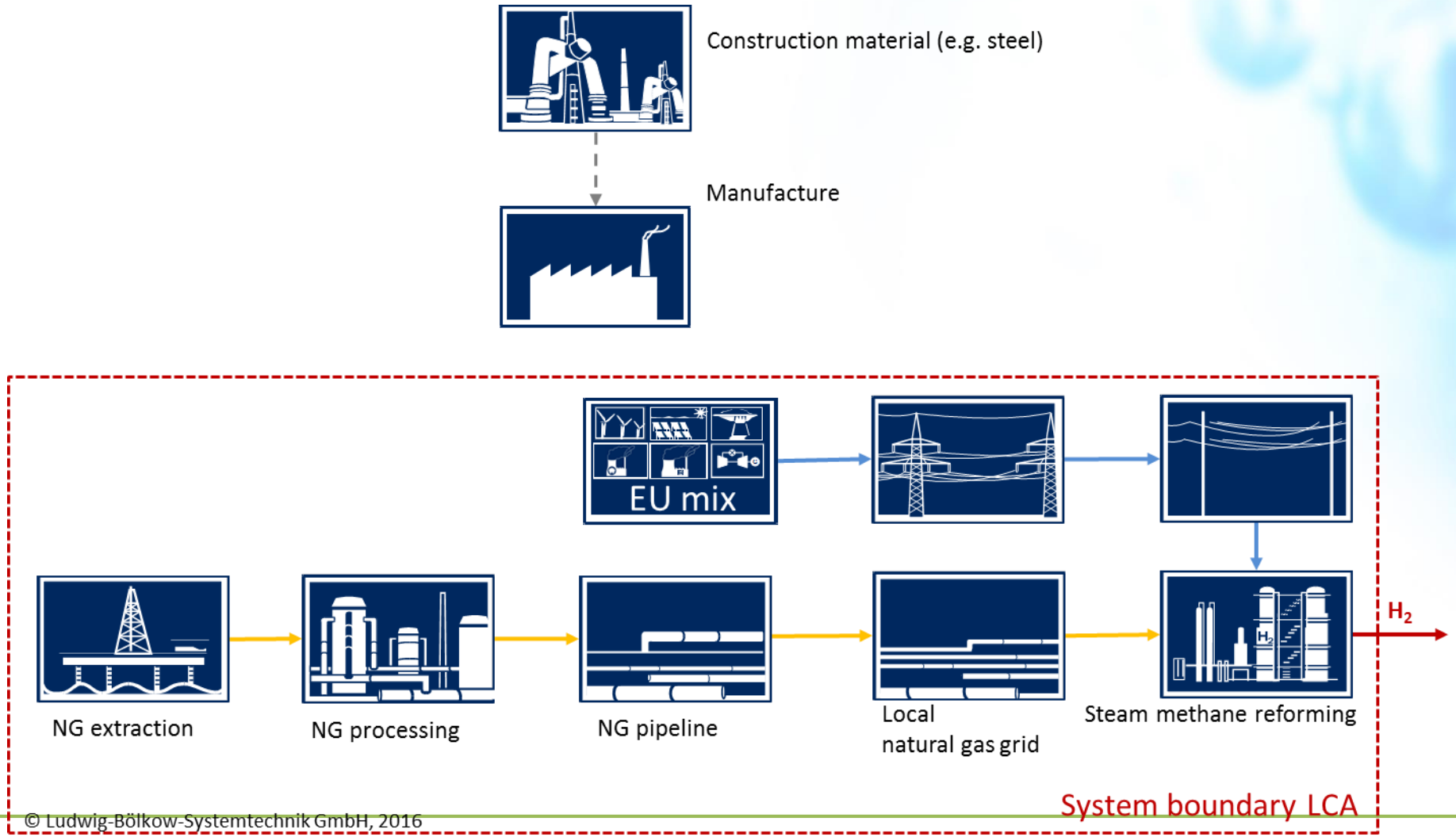
SMR onsite, 100% corn



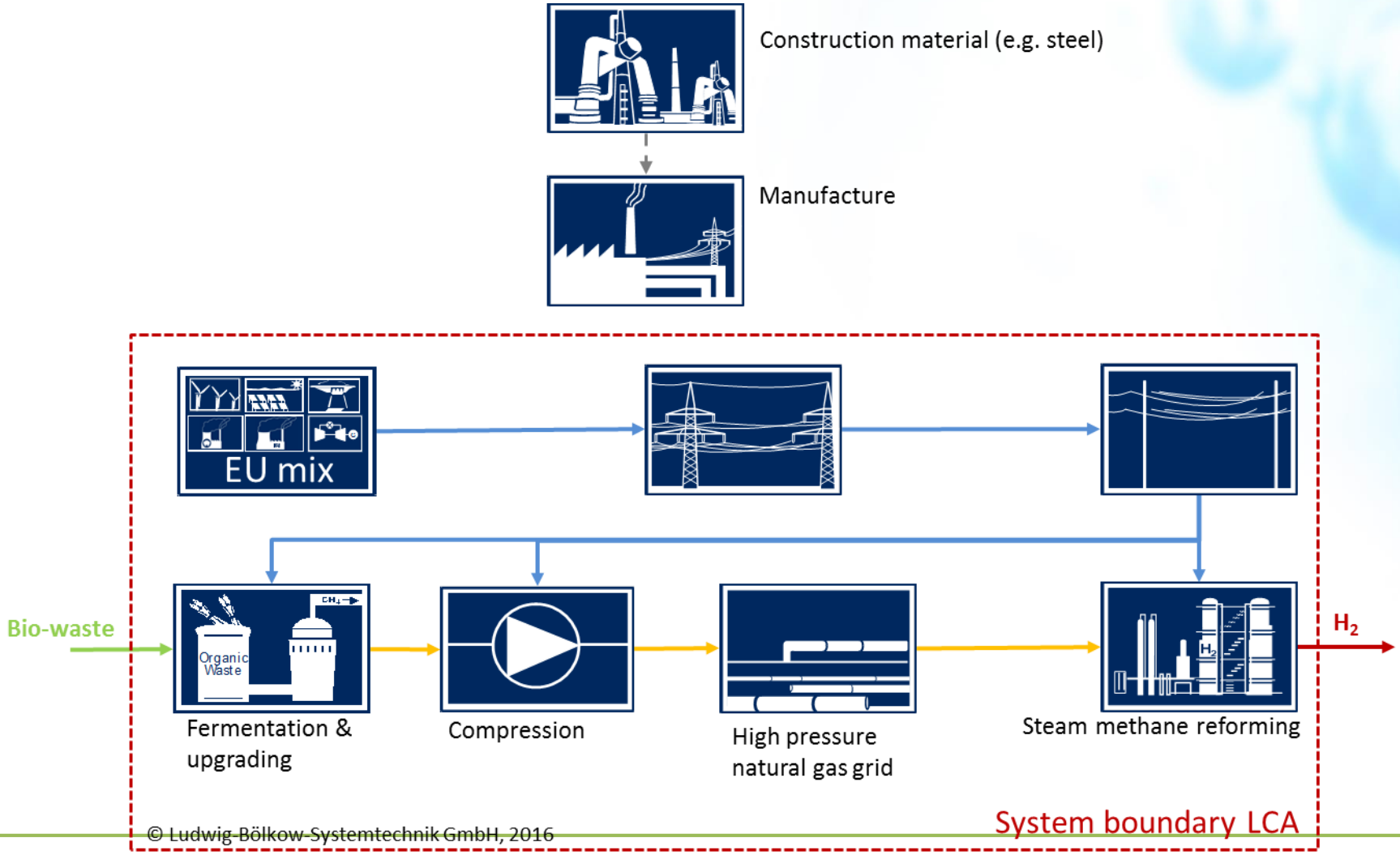
SMR onsite: 100% landfill gas



SMR onsite: 100% natural gas



SMR central: 100% bio-waste w/o CCS



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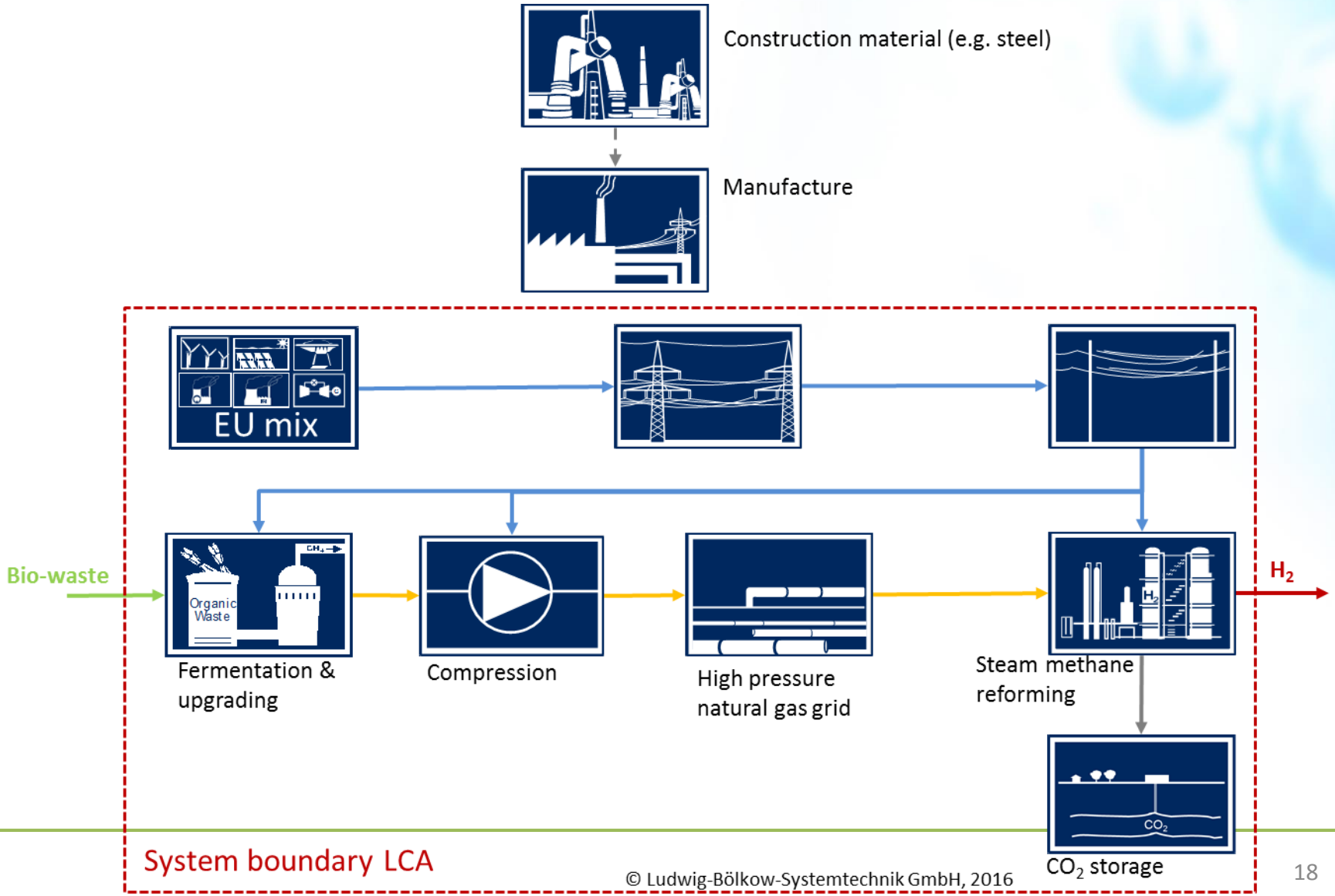
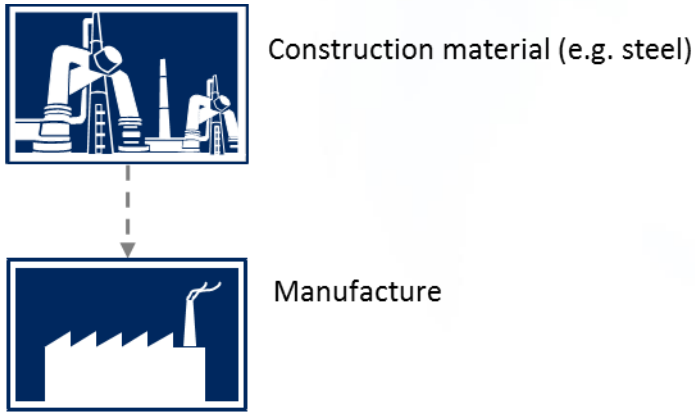
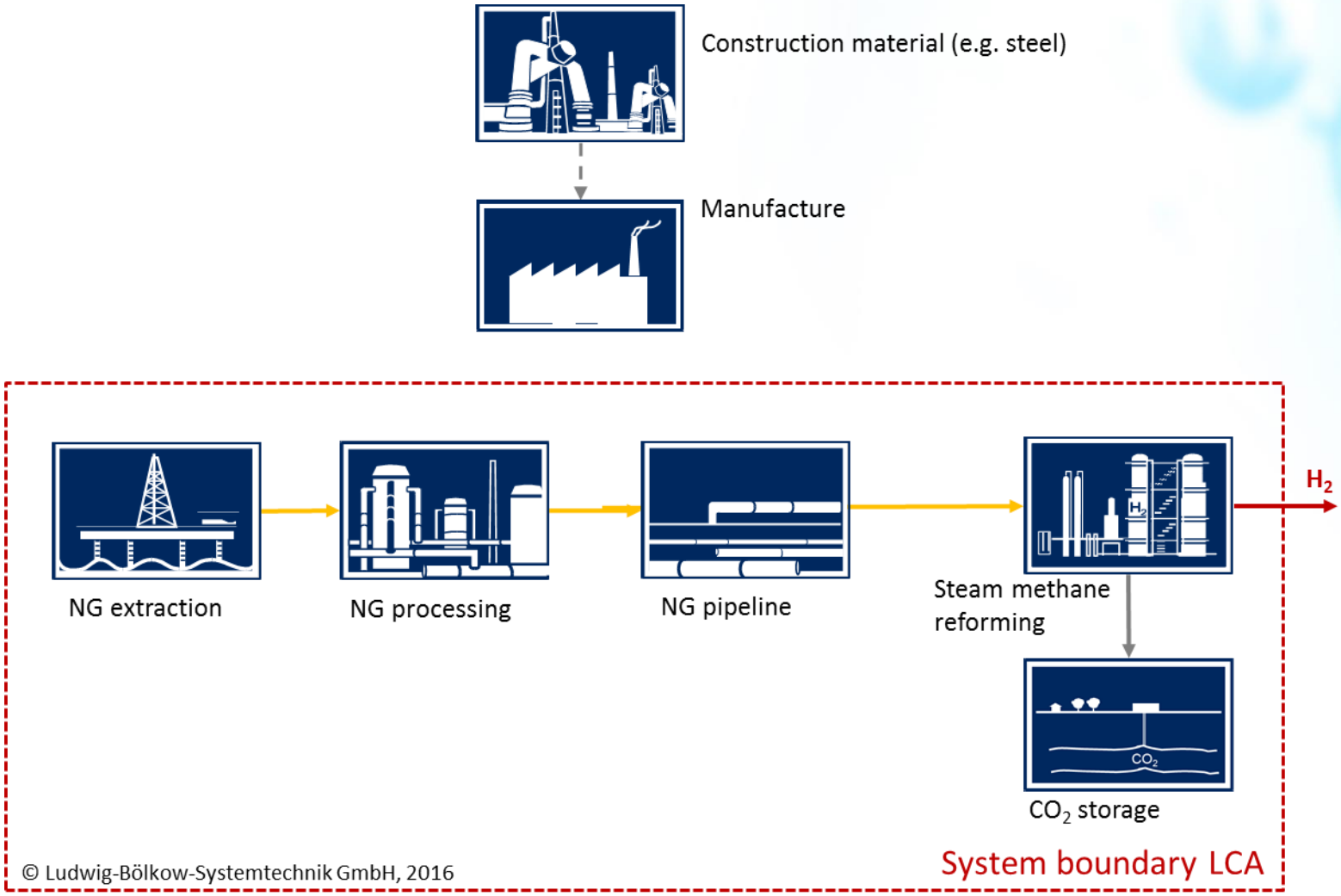


SMR central: 100% natural gas w/o CCS



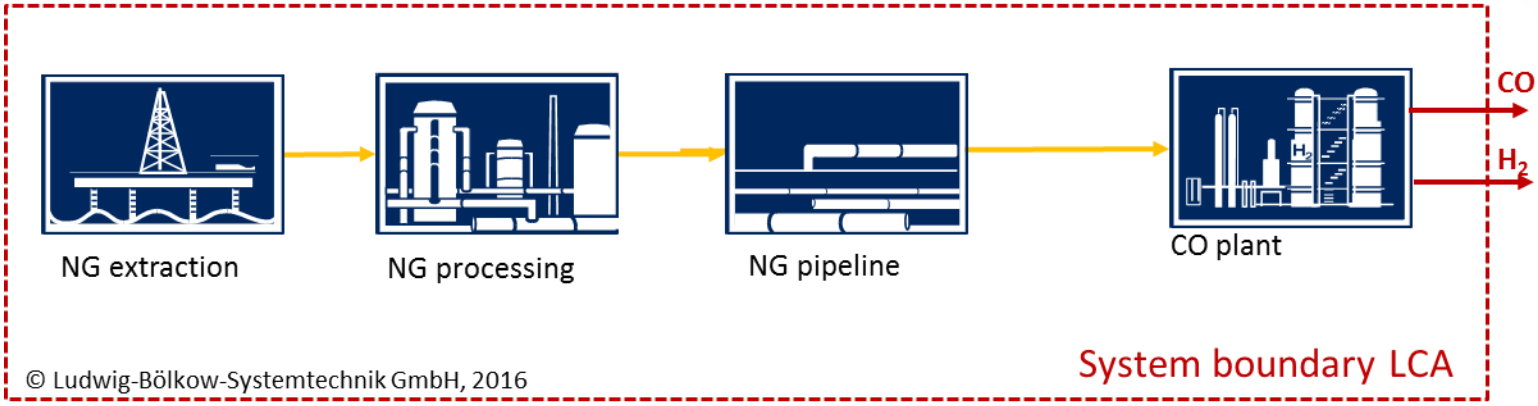
SMR central: 100% natural gas w CCS



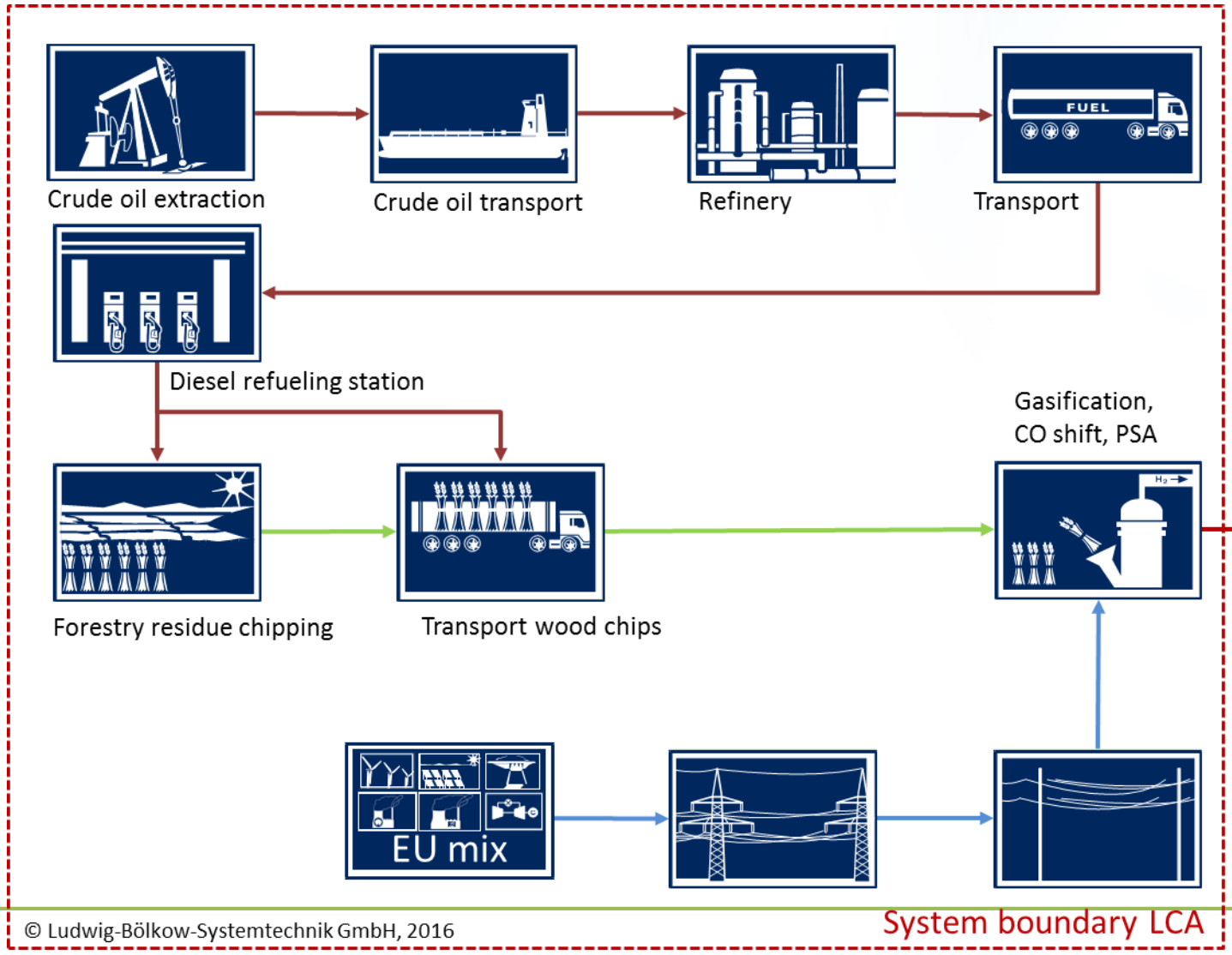
CO plant: 100% natural gas

Construction material (e.g. steel)

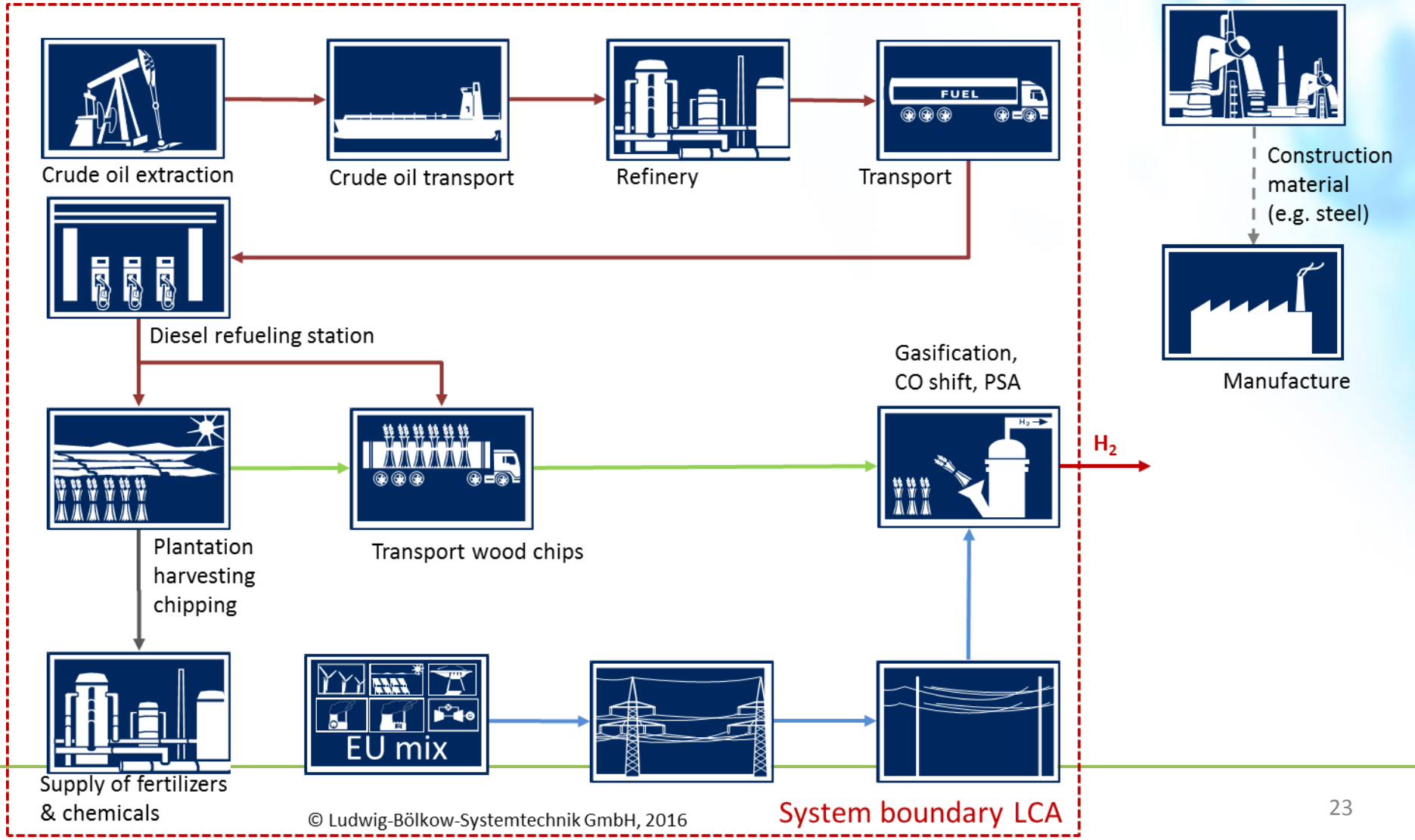
Manufacture



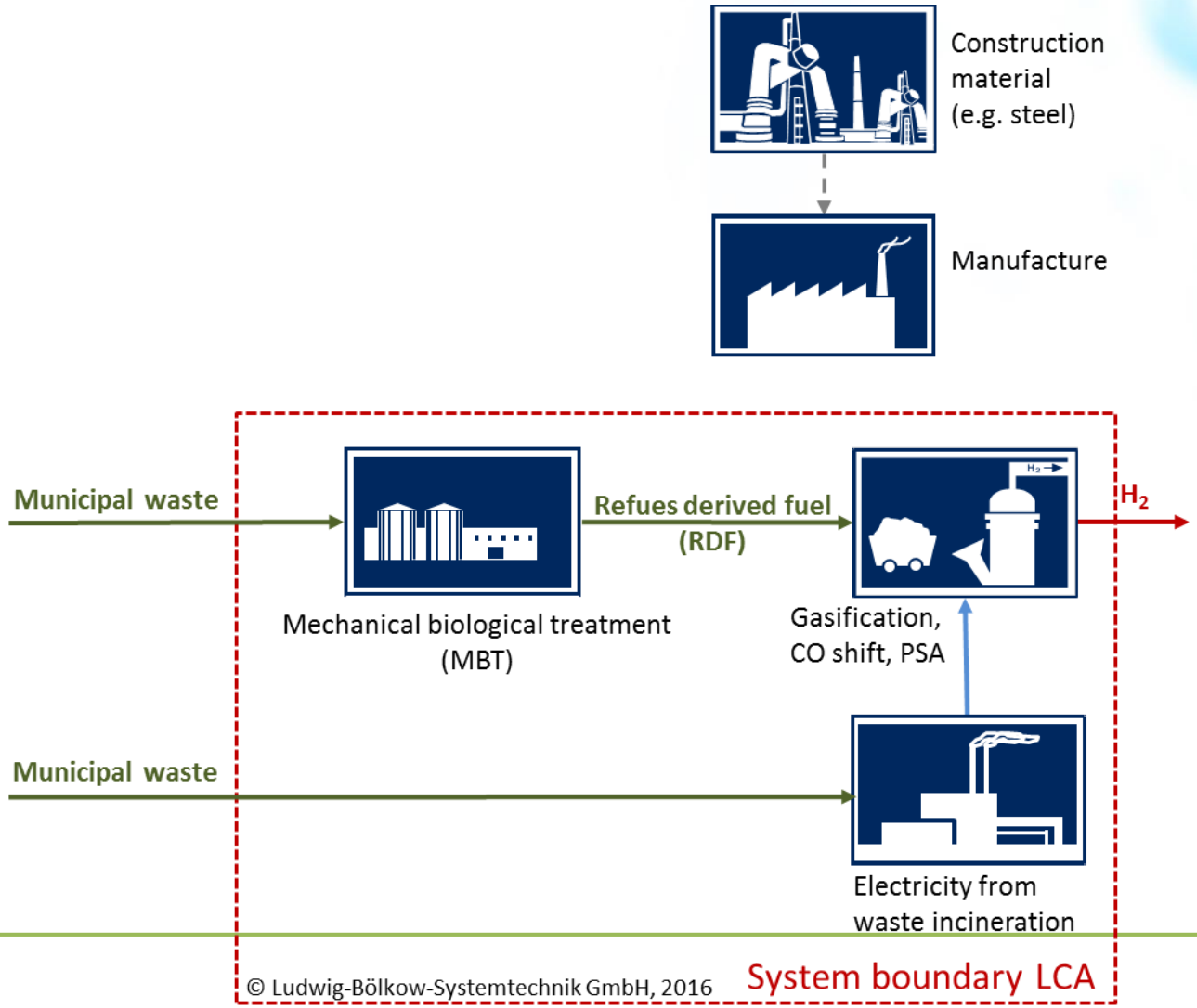
Gasification: 100% waste wood



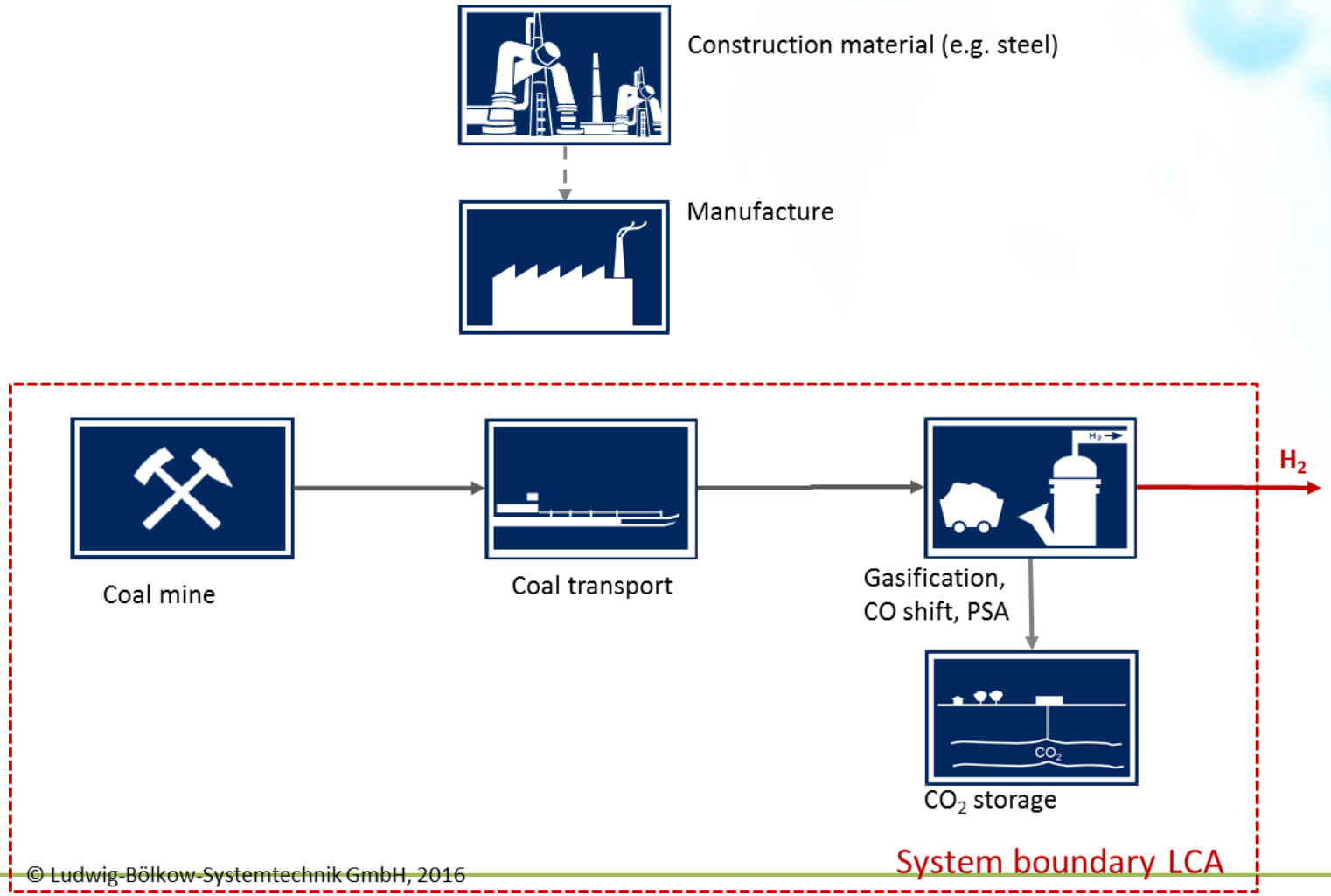
Gasification: 100% wood from short rotation forestry (SRF)



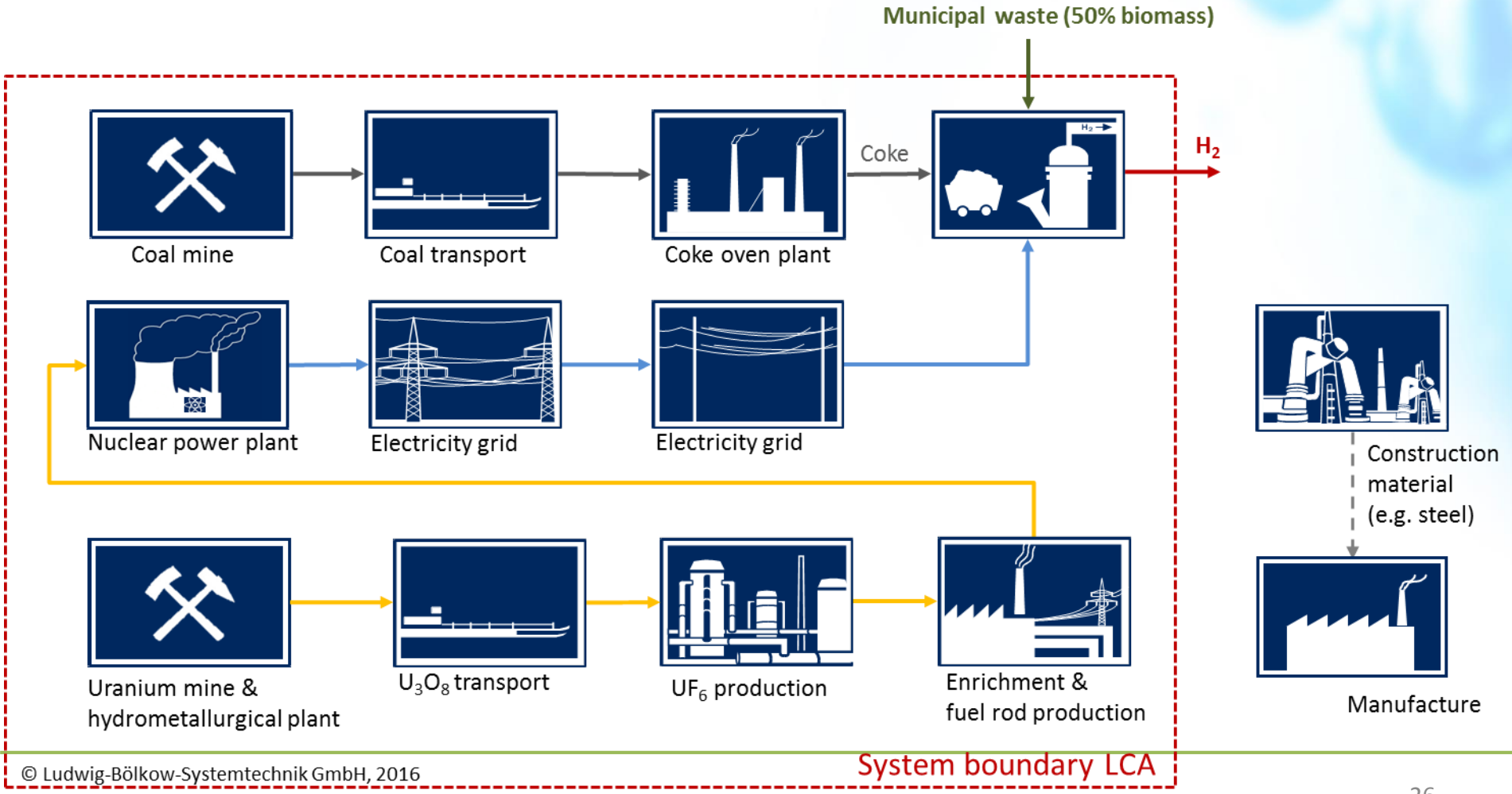
Gasification: municipal waste (50% or 80% biomass)



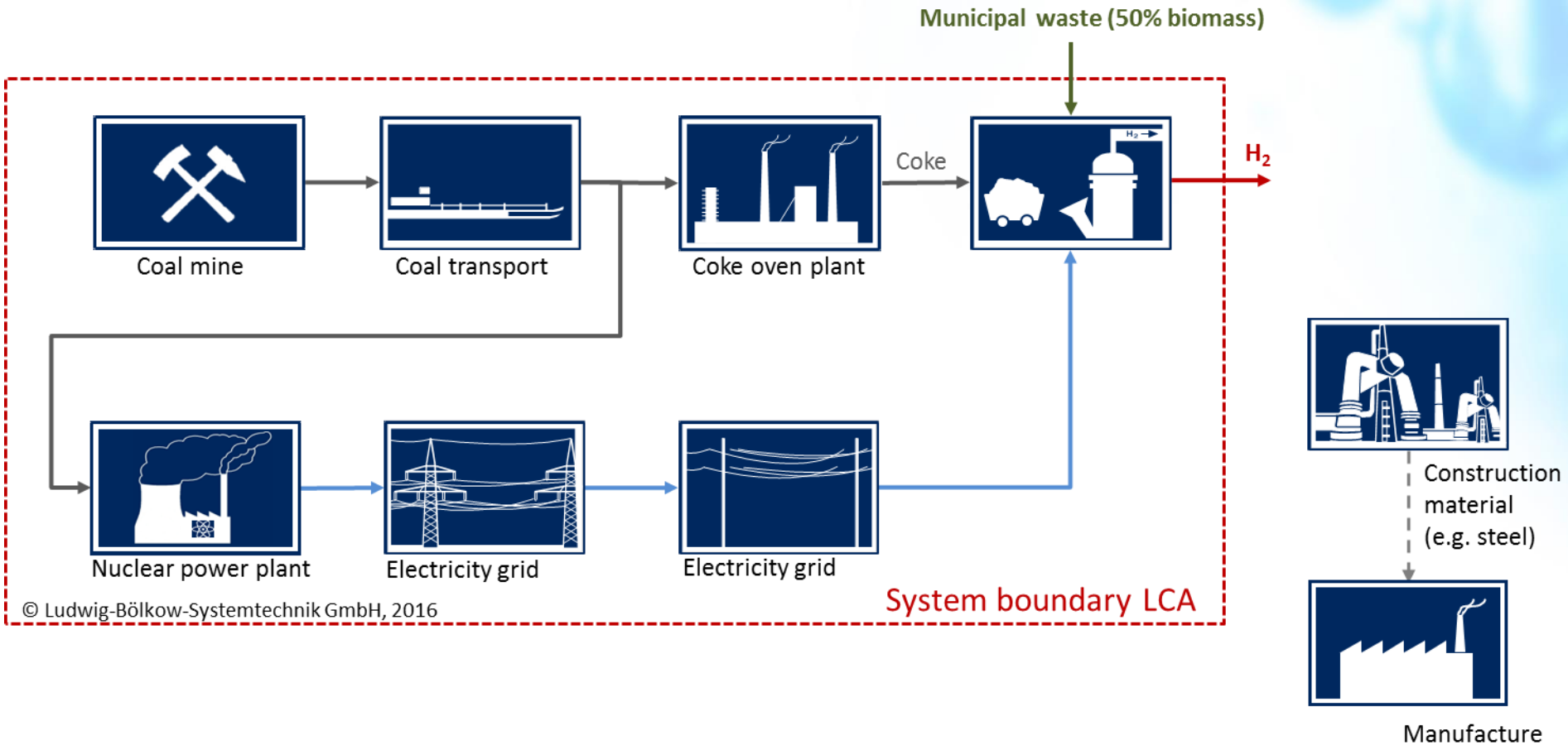
Gasification: 100% coal w CCS



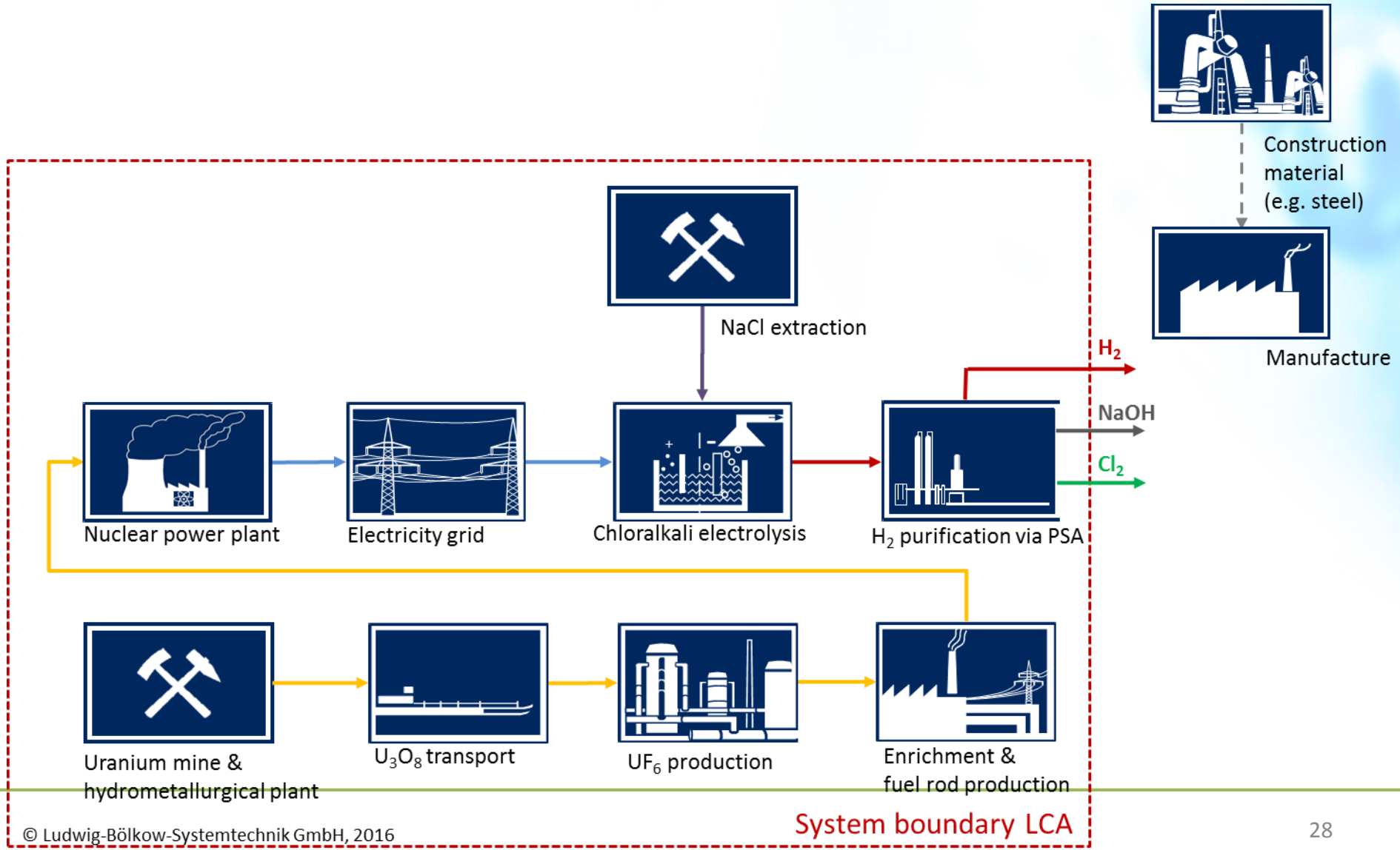
Plasma gasification: 100% nuclear electricity



Plasma gasification: 100% coal electricity



By-product H_2: Chloralkali electrolysis, 100% nuclear



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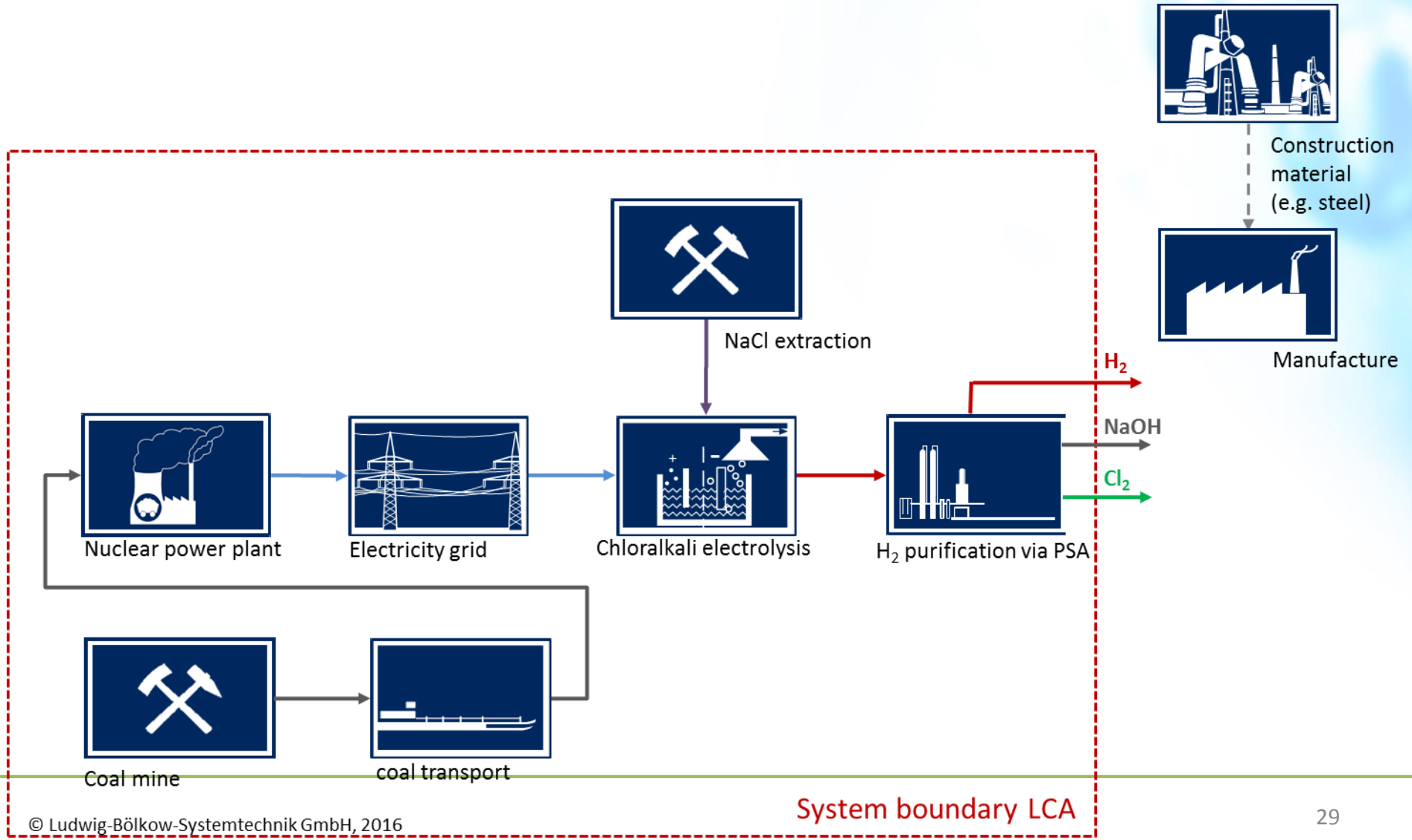
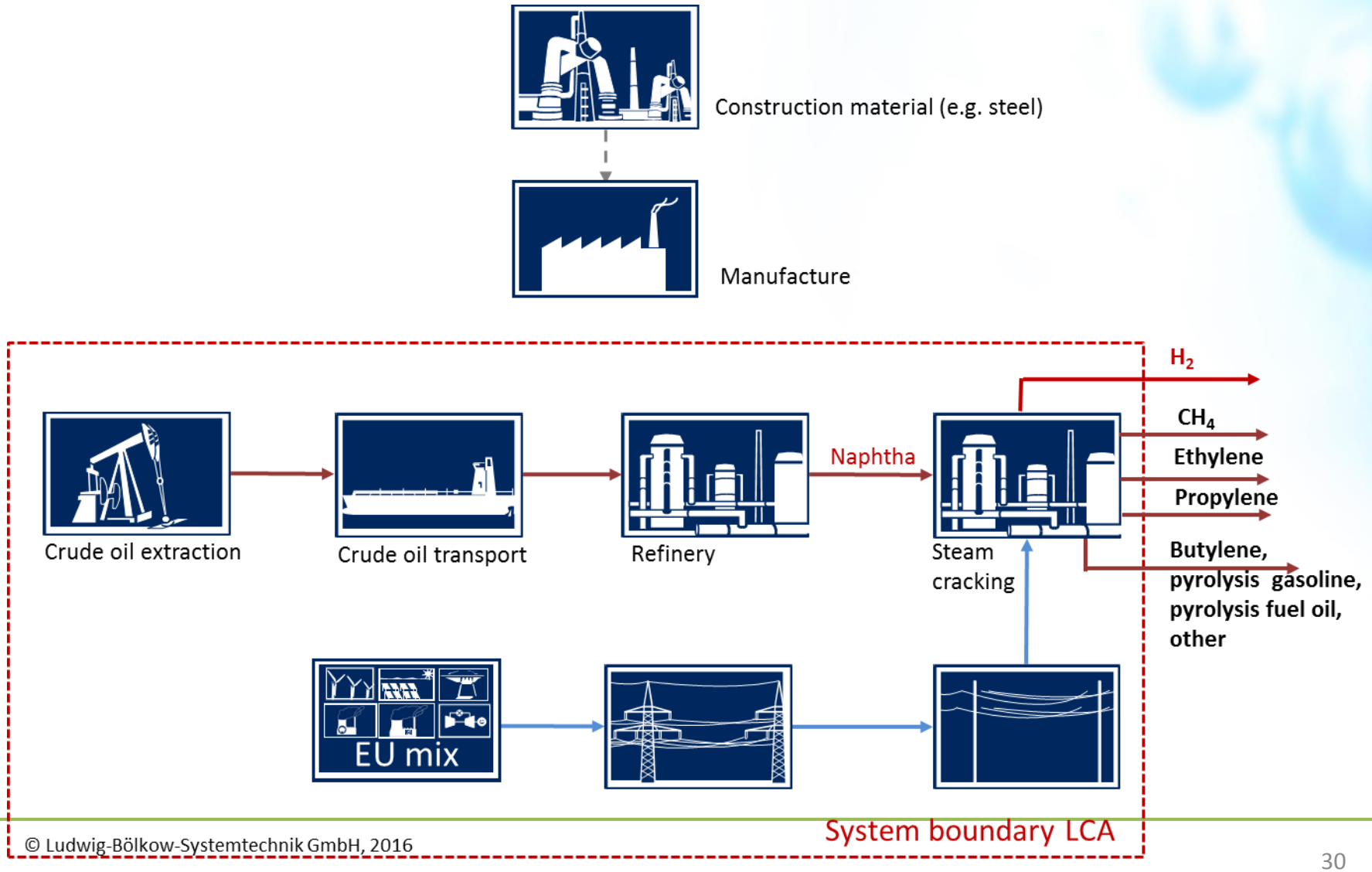


By-product H_2: Steam cracking



By-product: Natural gas decomposition