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European Coal Round Table

From Mining to Refining

Innovative concepts for making the most of coal

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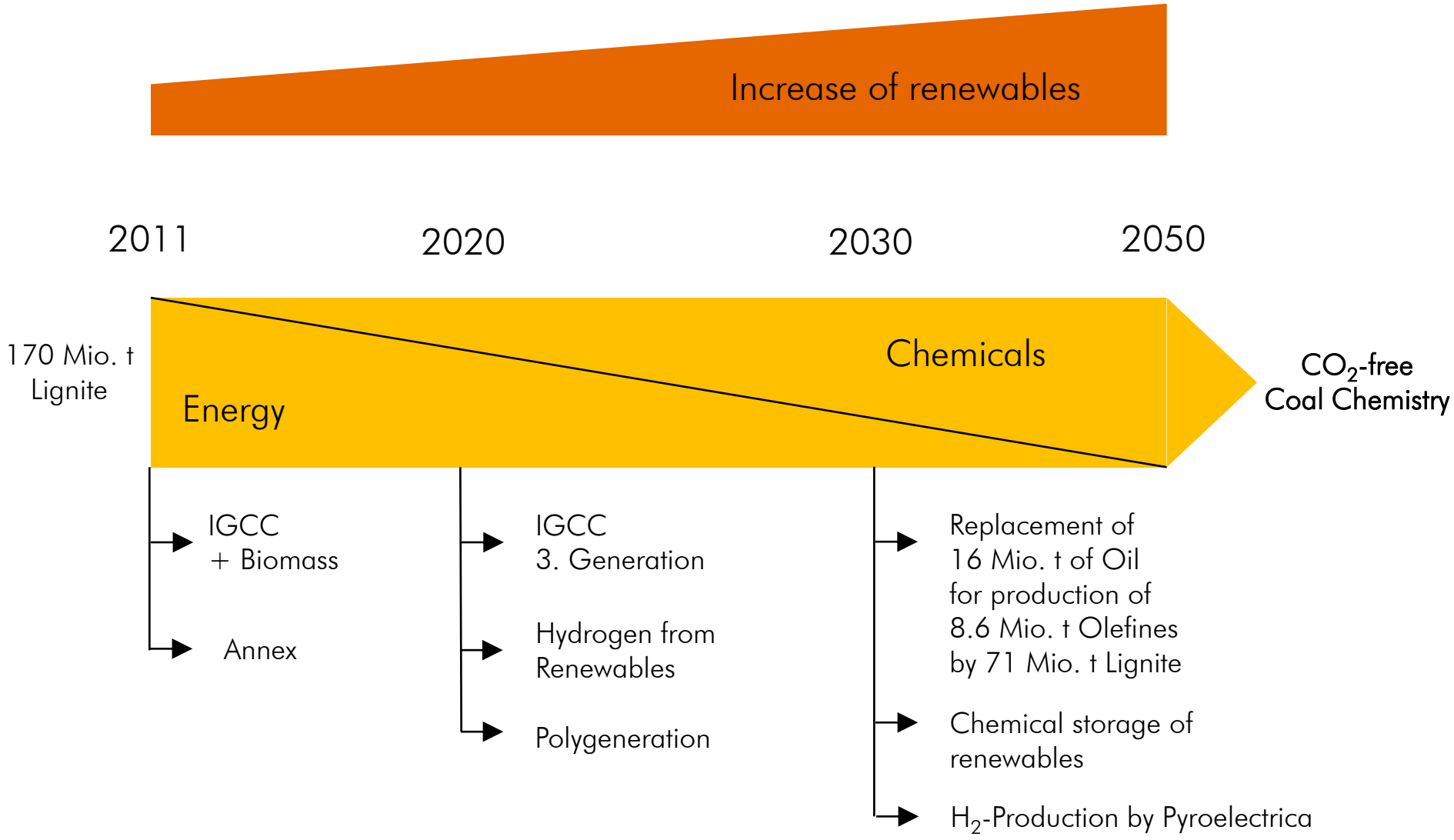
Duties in a future energy system

- Save and acceptable energy processes
- Robust and reliable technologies
- Taken into account EU's energy ressources
- Find a solution for the post oil area
- Combination with a huge amount of dezentralized energy systems
- System with inherent decrease in power production
- Extremely flexible processes (down to 20 % of base load)
- Give an answer on CO_2-emissions if CCS won't be realized
- Chemical energy storage

Coal Roadmap 2030



Perspective of coal utilization

1. Today – Energetic use

Coal + Oxigen = CO_2 + Water

$C_1H_{0,80}O_{0,06}$ + 1,1725 O_2 = 1,0 CO_2 + 0,405 H_2O

2. Tomorow – Non-energetic use

Coal + $Steam_{(Shift)}$ + Oxygen = CO_2 + Synthesis gas

$C_1H_{0,80}O_{0,06}$ + 0,4 H_2O + 0,8 O_2 = 0,6 CO_2 + 0,4 CO + 0,8 H_2

Methanol

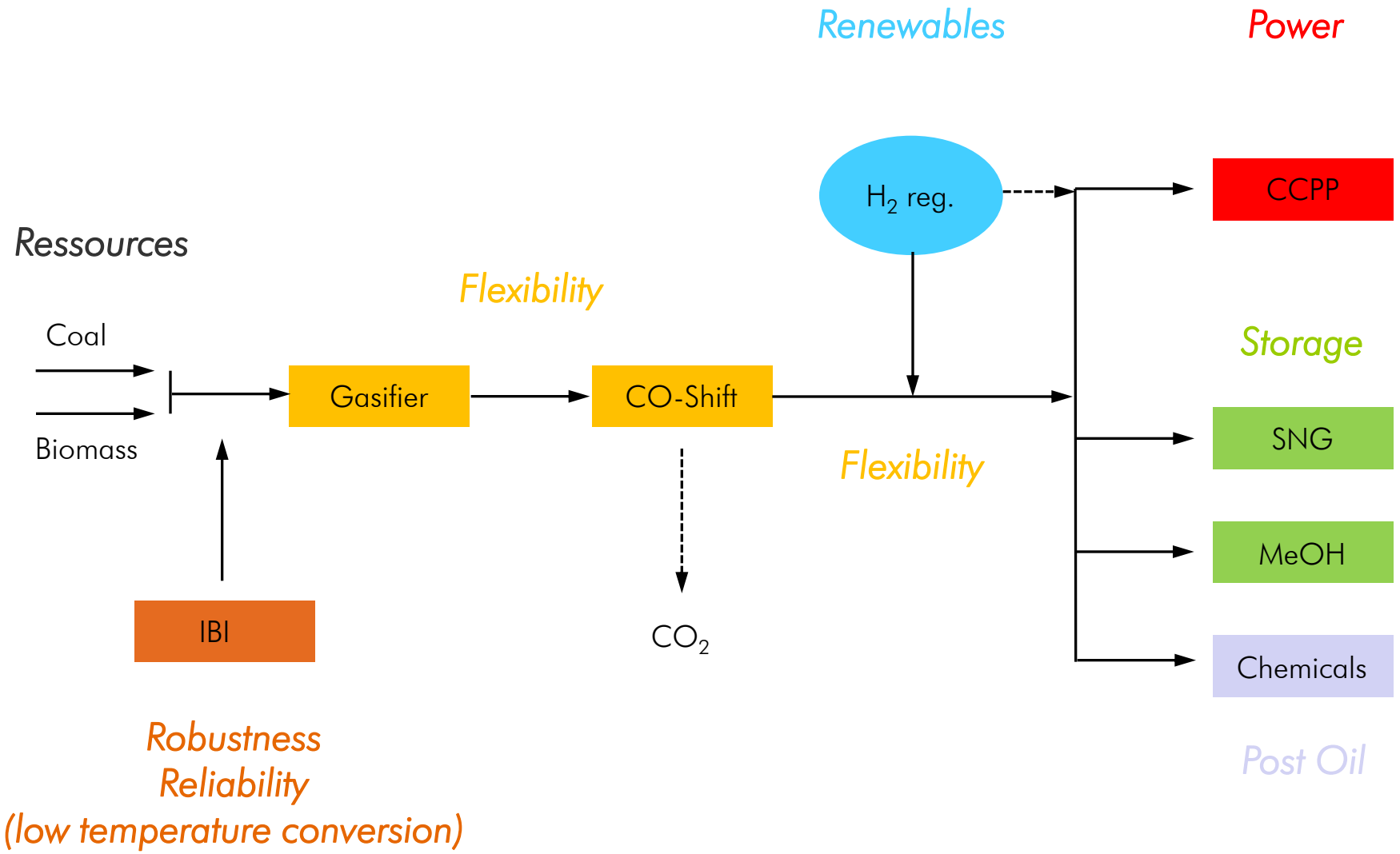
3. Future – CO_2-free coal chemistry

Coal + Oxygen = 0% CO_2 + Synthesis gas

$C_1H_{0,80}O_{0,06}$ + 0,5 O_2 + (x - 0,4) $H_{2(reg.)}$ = 1,06 CO + 0,4 H_2 + (x-0,4) H_2

Olefine, Benzine:	X = 2
SNG:	X = 3

Strategy 1: IGCC



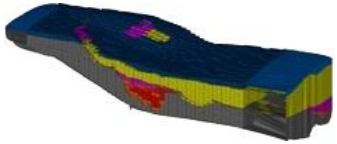
Strategy 2: ibi

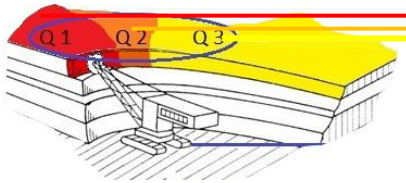
Quality management

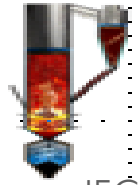
Conversion processes

Deposit-Exploration	Selective Mining	Preparation Extraction	Low-Temperature Conversion	Gasification

Different Coal Qualities







Institute
- Mine-surveying
- Geogogy
- MIBRAG

- Mining and mine operation
- Automation
- Informatics
- MIBRAG, ABB, TAKRAF, FAM, Siemens

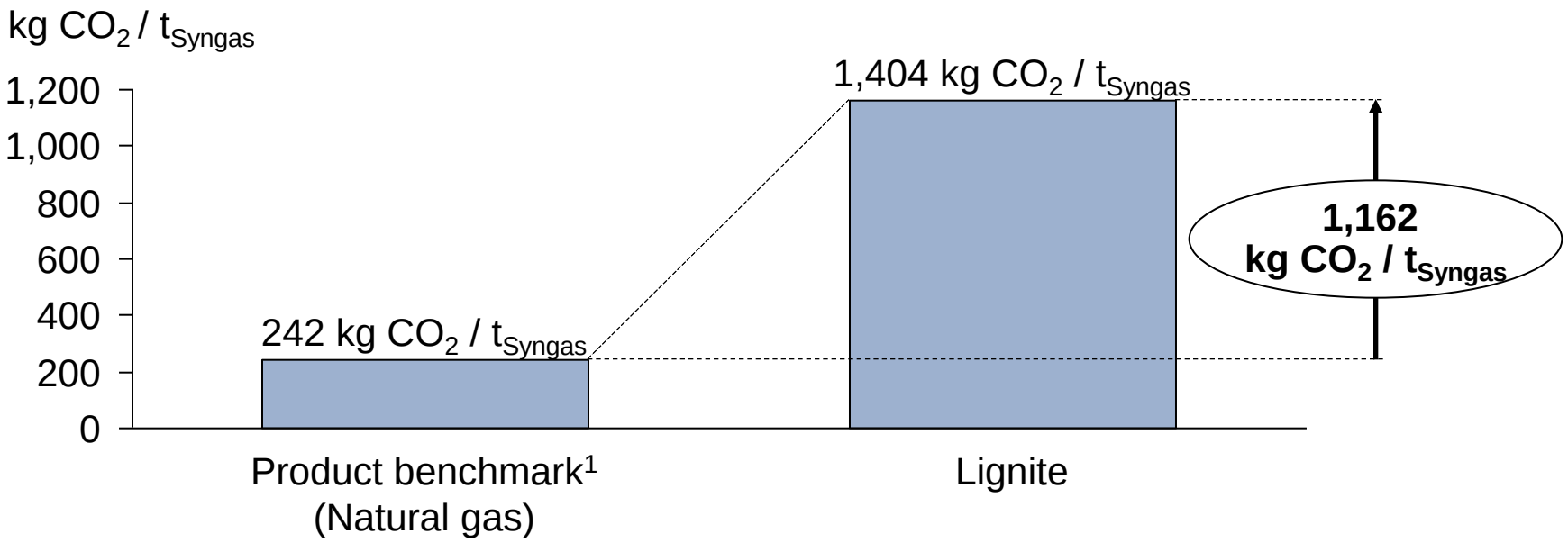
- Thermal, Environmental and Natural Products Process Engineering
- ROMONTA
- EPC

- IEC, DER and Virtuhcon
- HOME
- MLU
- FAU
- EPC

- IEC, DER and Virtuhcon
- InfraLeuna
- Linde

- Resource Management – Economics
- Industrial Partner Companies

Specific CO_2 emissions per Syngas



- **Guidance Document n°9 on the harmonized free allocation methodology for the EU-ETS post 2012 refers to natural gas-based product benchmark with 0.242 allowances / t_{Syngas}**

- **Need for different product benchmark based on lignite!**

1: http://ec.europa.eu/clima/documentation/ets/docs/benchmarking/gd9_sector_specific_guidance_en.pdf

Future need for research

- Process efficiency (energetic, non-energetic)
- Development of innovative industrial Gasification Processes
  - IGCC - utilization of renewables (biomass, hydrogen)
  - Transition to a flexible CO-shift processing
  - Utilization of excess current (production of hydrogen, SNG, MeOH)
  - Production of hydrogen: electrolysis vs. PyroLabs
- Energy storage facilities
- CO_2-free Coal Chemistry
- European research networks
- Coal Chemistry in FP8

Glück auf!

Thank you very much for your attention!

German Energy Concept (as of 28 September 2010)