The use of alternative fuels as a key strategy to address the European Green Deal

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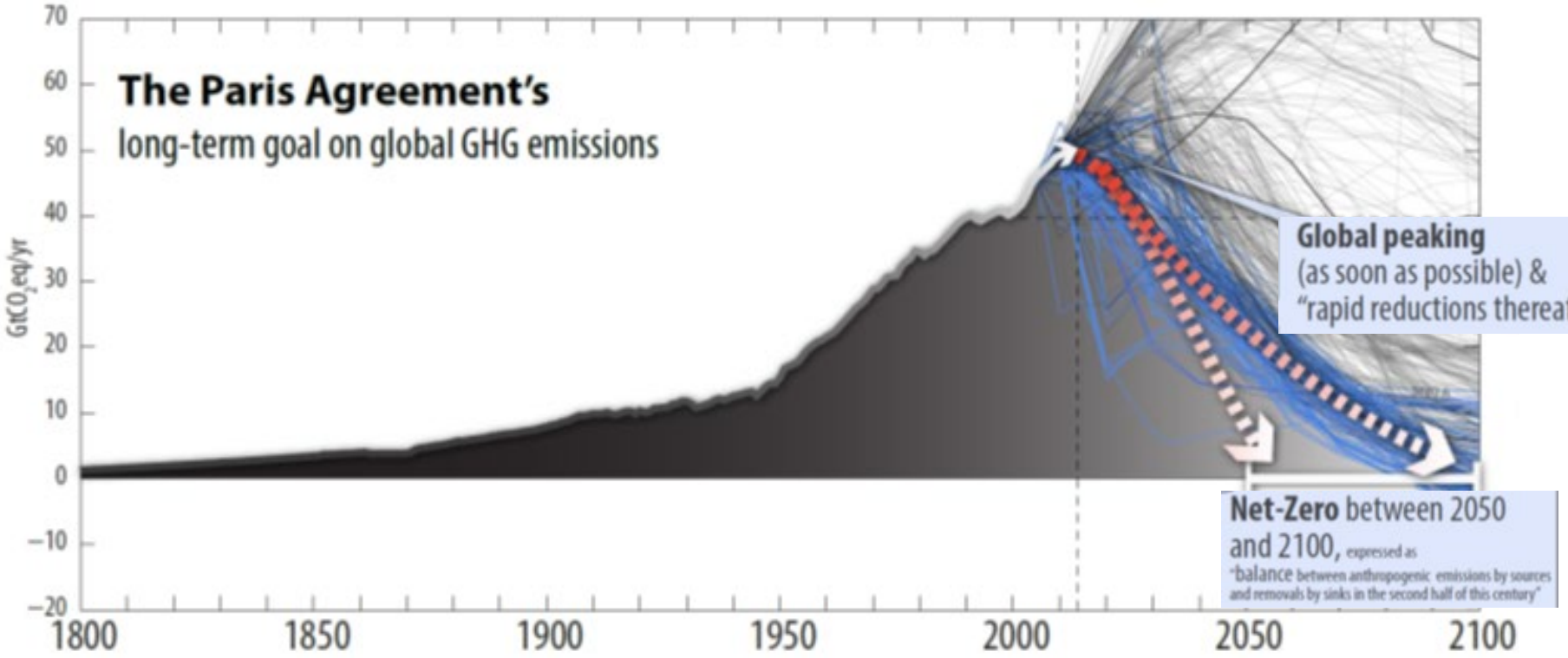
The Paris Agreement's long-term goal on global GHG emissions



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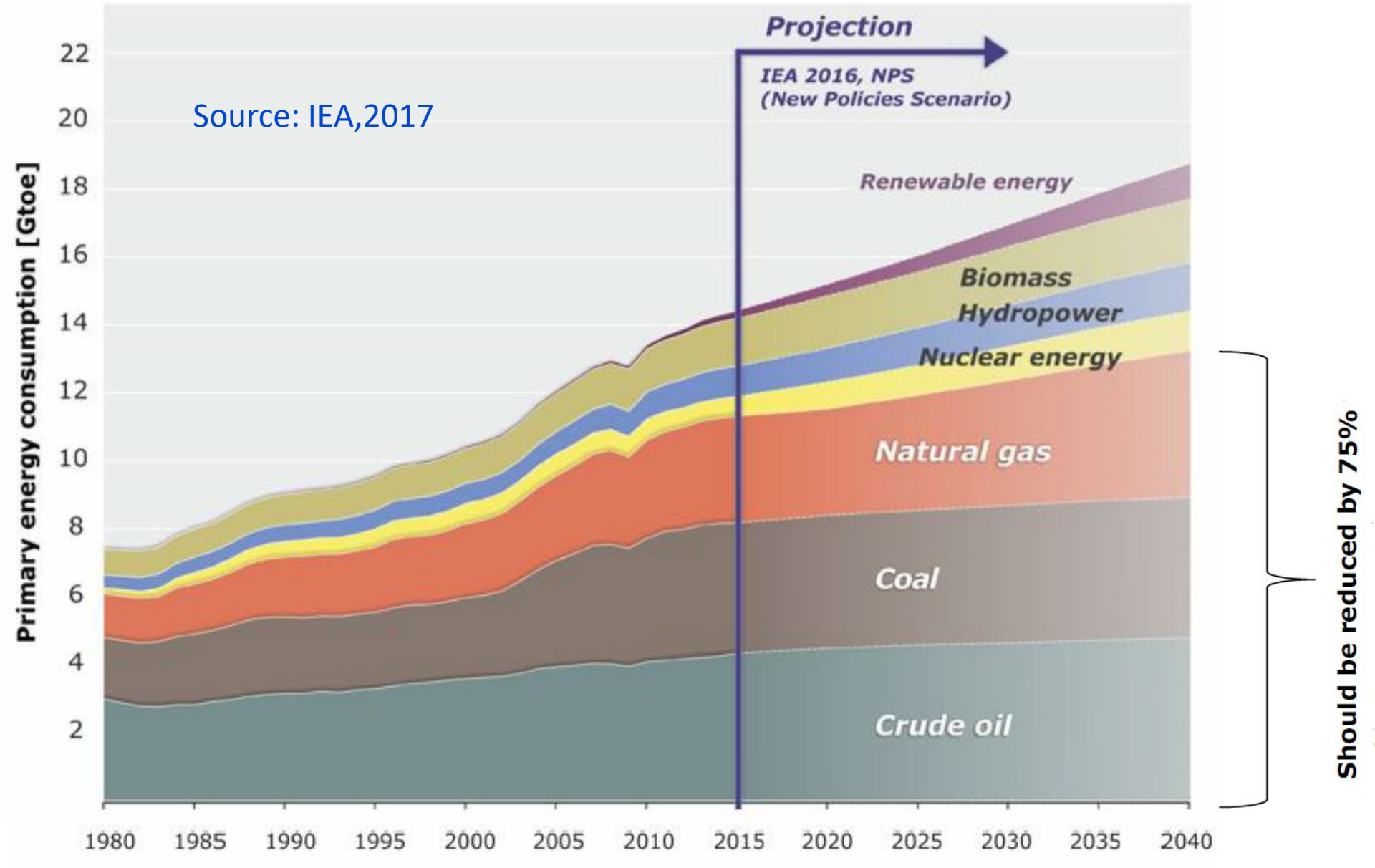
IEA forecast for the global energy consumption



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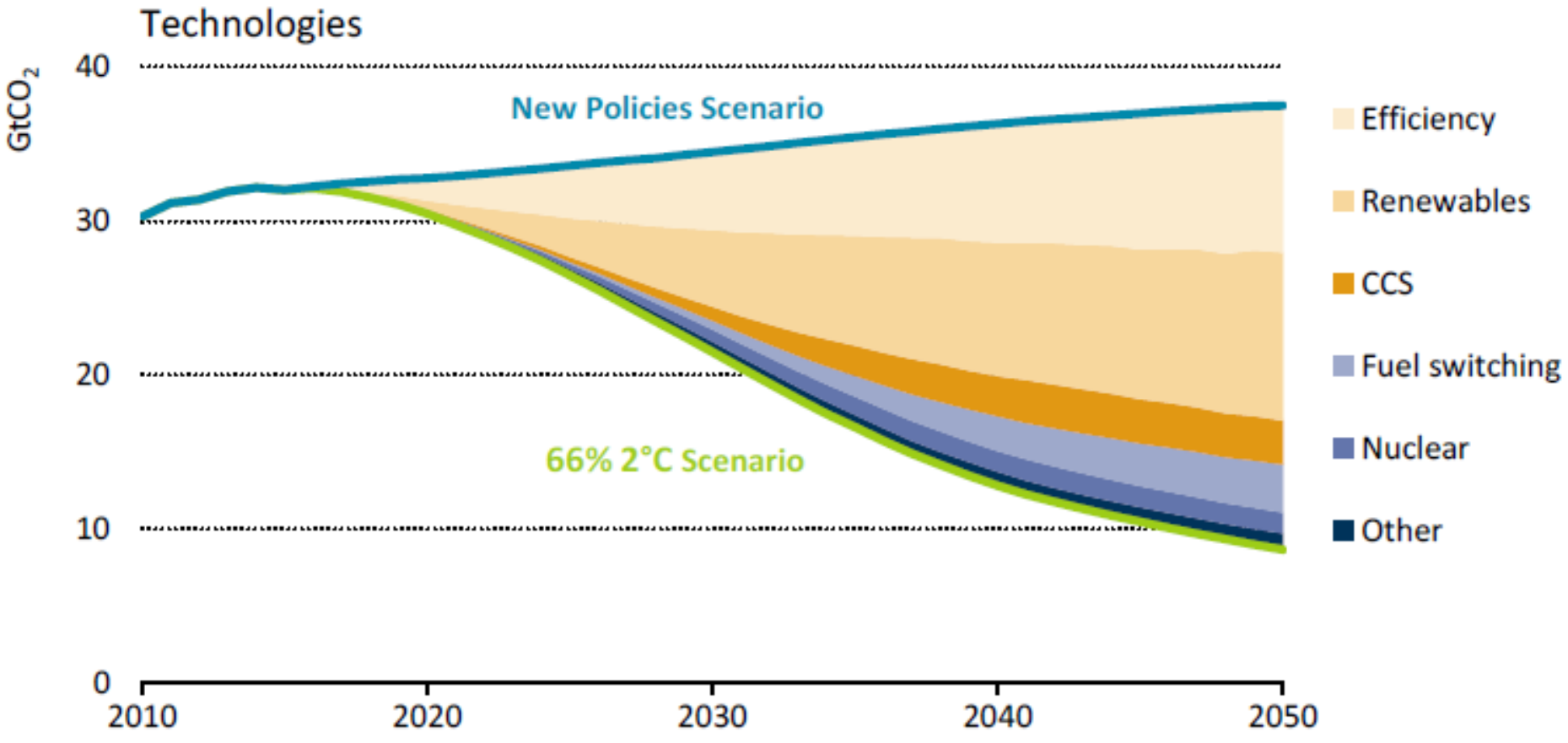
Global emissions abatement by technology in the 66% 2°C scenario relative to the New Policies Scenario



Source: IEA, 2017

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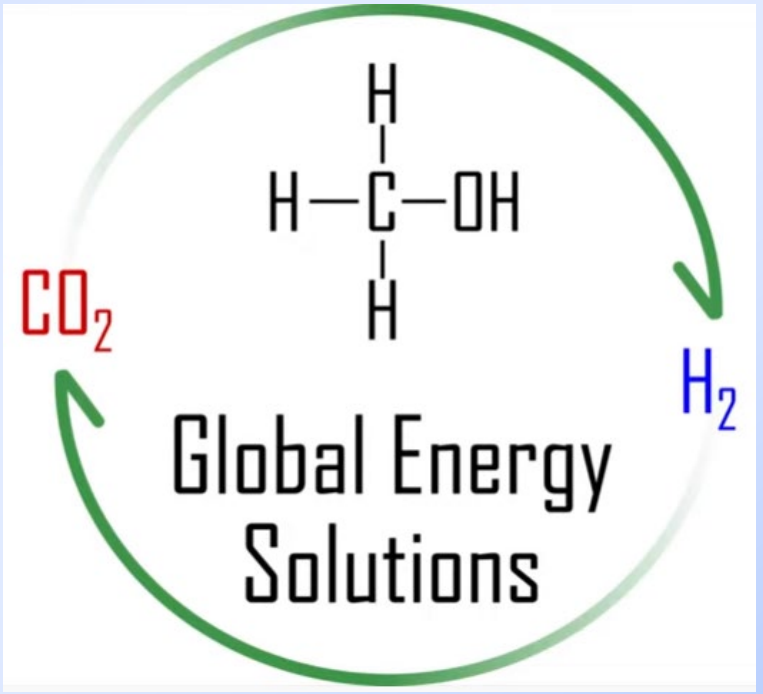
Methanol Economy and soil improvement for closing the carbon cycle



Association Foundation Aug. 27, 2020

Honorary Doctorate conferment on **Professor Radermacher**, Nov. 8, 2013

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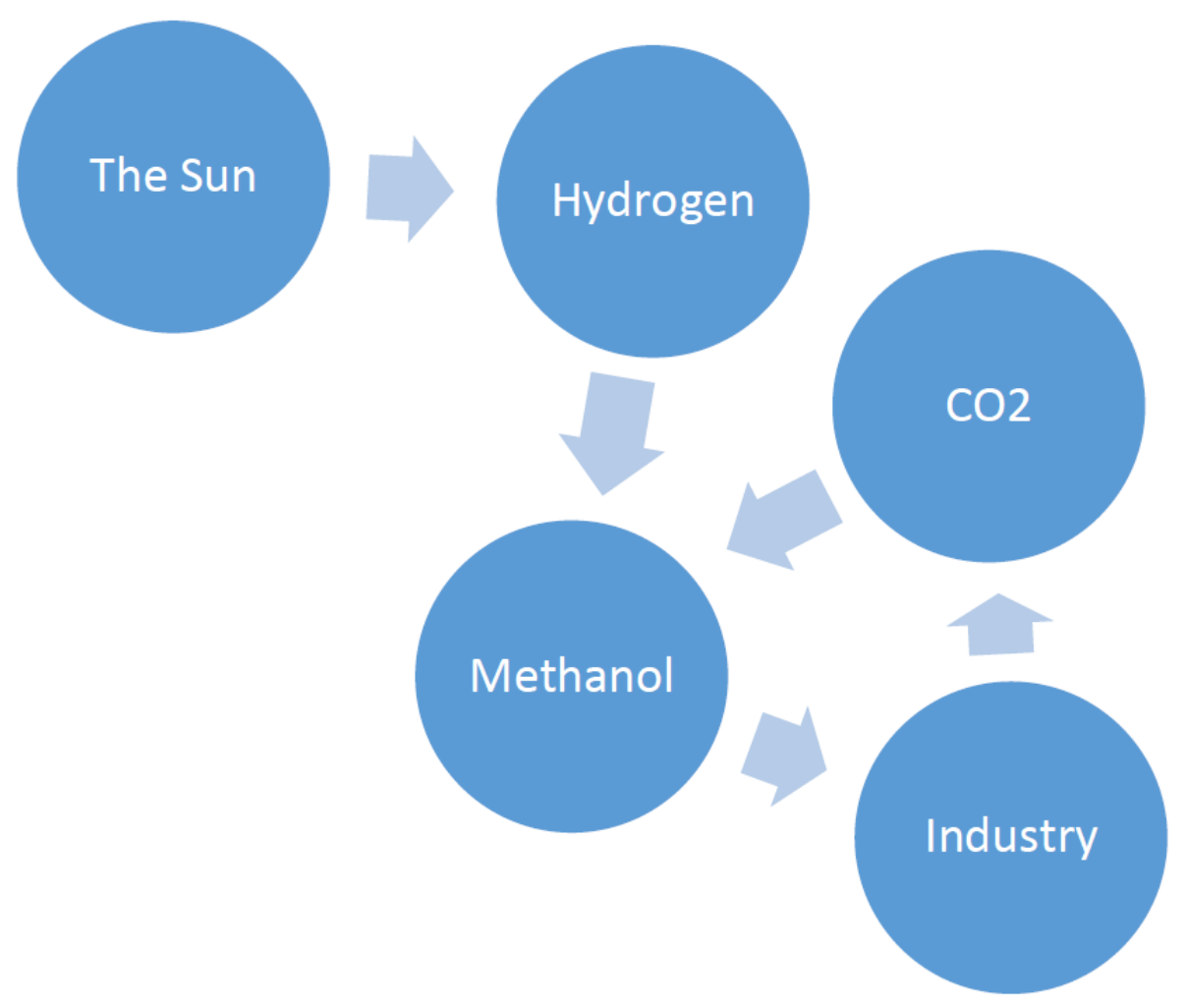
Methanol Economy principle

- Solar energy drives electrolysis to separate $2H_2 + O_2$
- H_2 and CO_2 make methanol (CH_3-OH)
- That can be burnt in industry or vehicles releasing CO_2
- The process includes large scale CO_2 recycling.



Source: Ernst Ulrich von Weizsäcker - Honorary President of the Club of Rome , Brutally short summary of Franz Josef Radermacher's proposal for a "Methanol Economy" or "Desertec 2.0", 2019

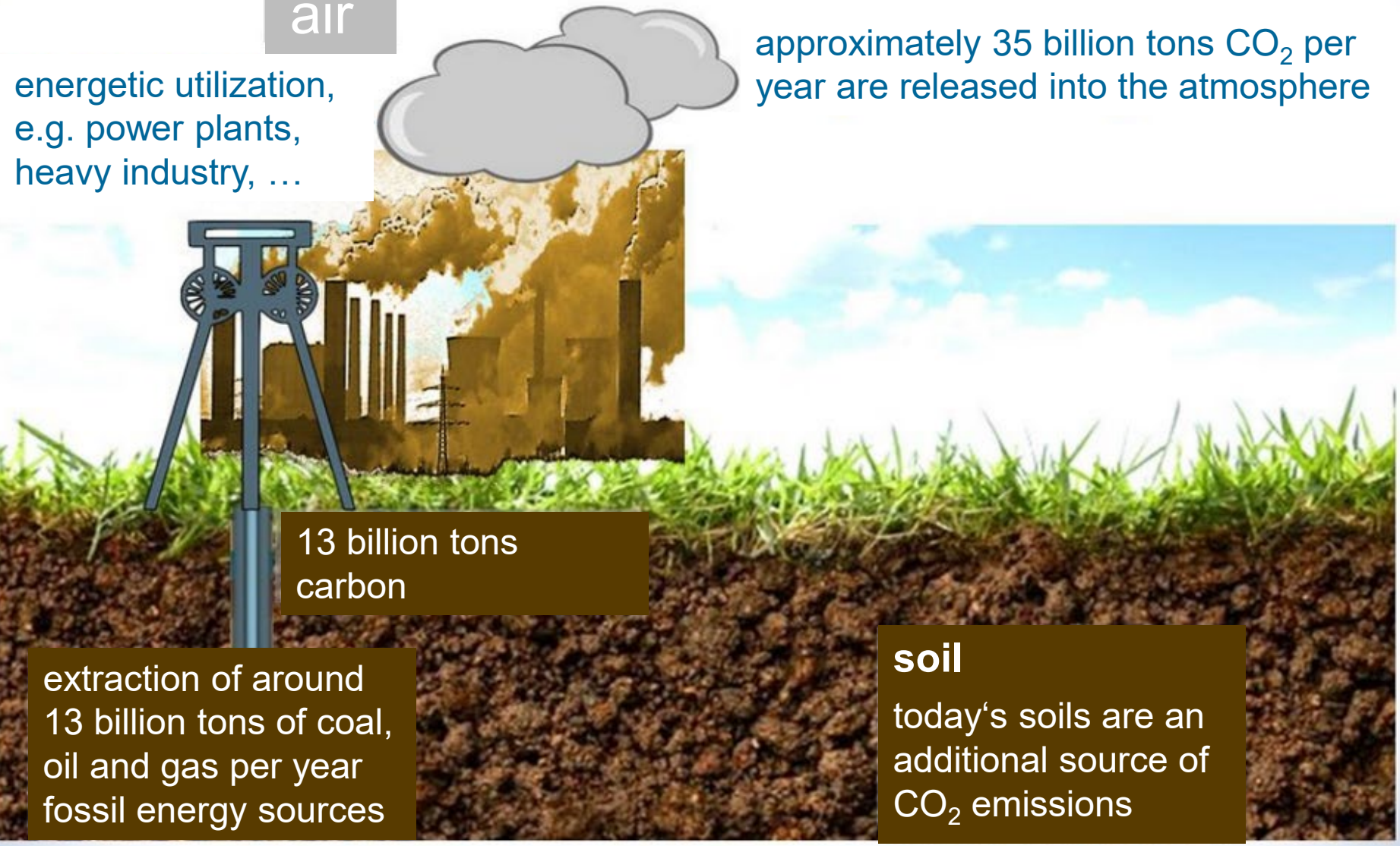
Carbon Cycle energy today

Power plants, heavy industry, chemicals, mobility sector, heating, …

air

energetic utilization, e.g. power plants, heavy industry, …

approximately 35 billion tons CO_2 per year are released into the atmosphere



13 billion tons carbon

extraction of around 13 billion tons of coal, oil and gas per year fossil energy sources

soil

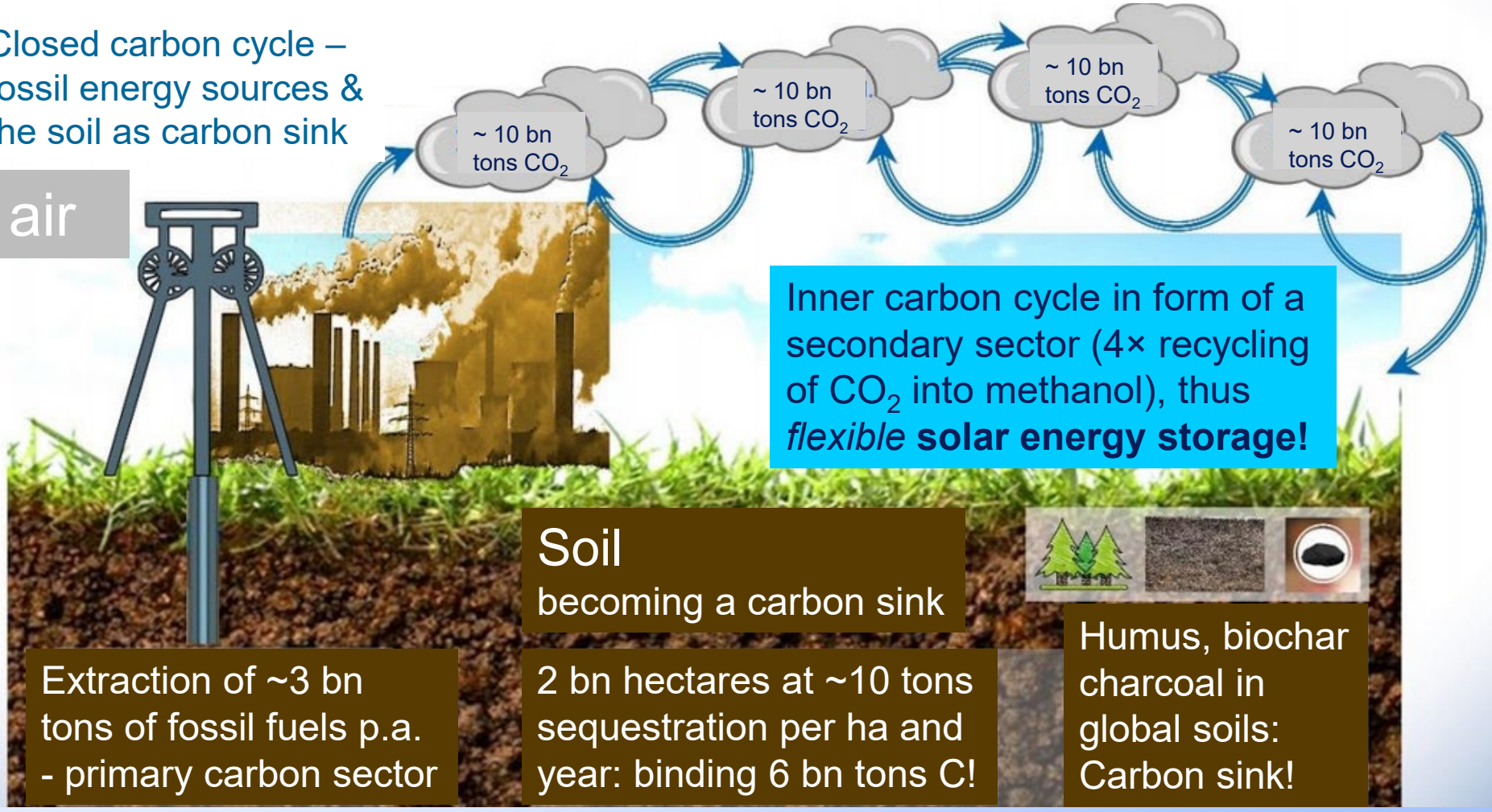
today‘s soils are an additional source of CO_2 emissions

Closed Carbon Cycle energy future

Industry sectors connected to fossil fuels (e.g. power plants, heavy industry) preserved/transformed within their current economic magnitude.

Industries based on two pillars: primary (fossil fuels) & secondary (methanol economy)

Closed carbon cycle – fossil energy sources & the soil as carbon sink



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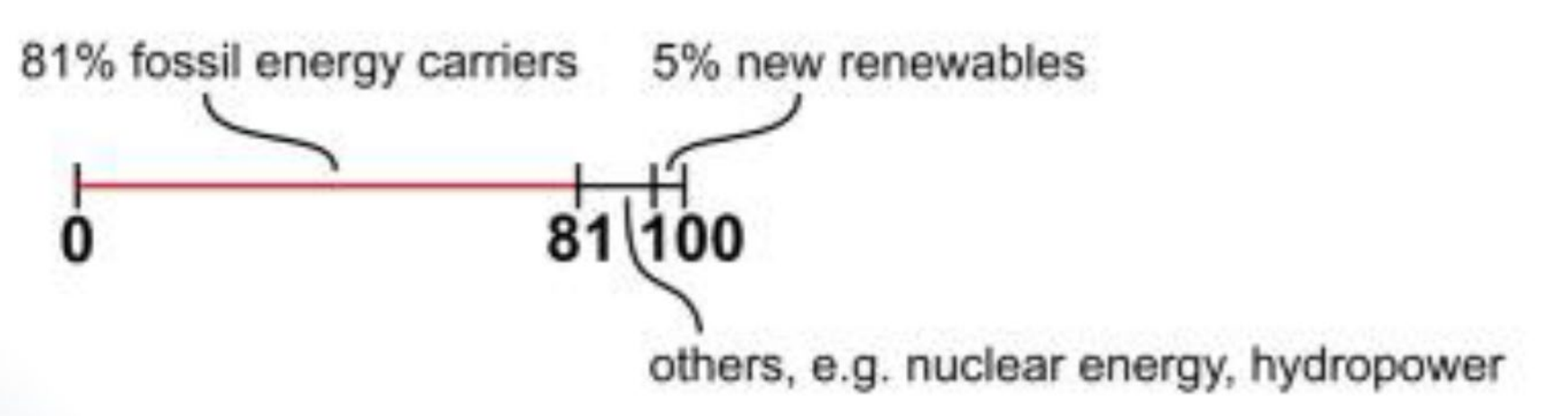
Energy situation 2020

7.5 billion people global GDP 80 trillion €

High inequality, especially between countries

Composition of primary energy consumption:



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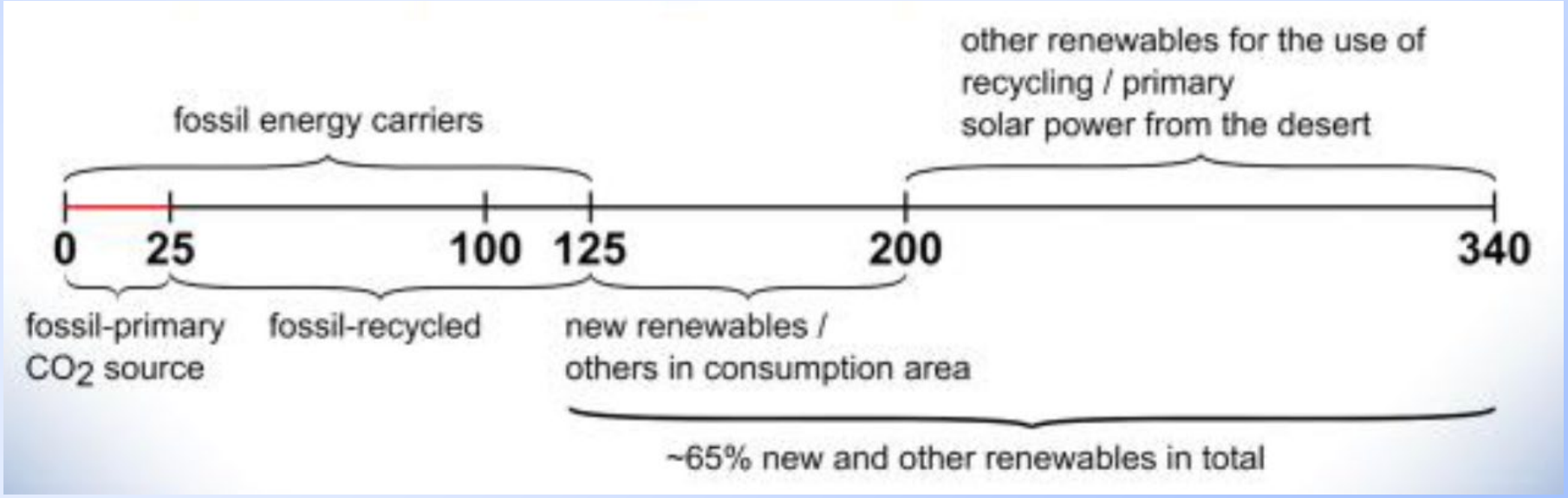
Energy situation 2050

(according to reference scenario)

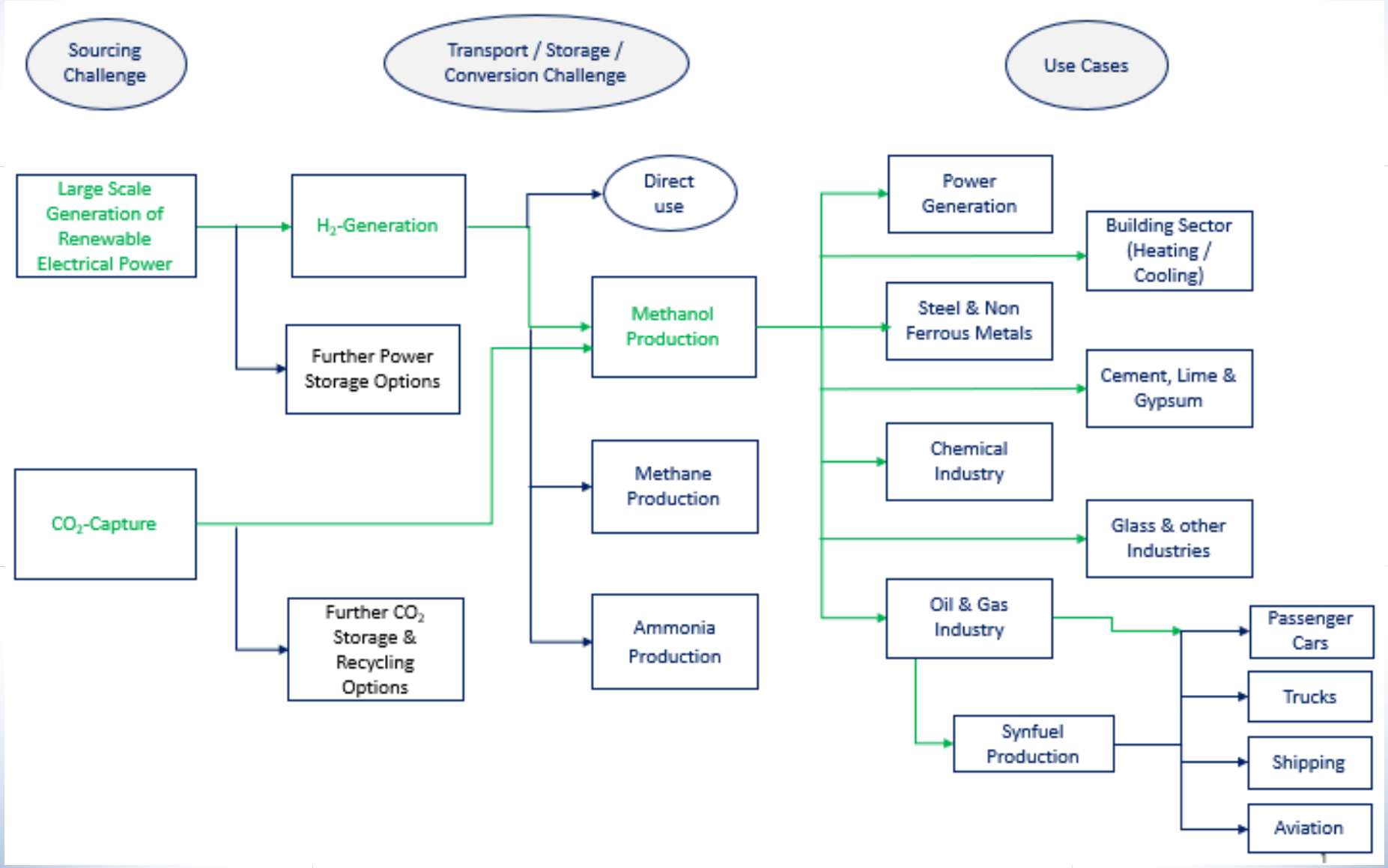
10 billion people (peak of the global population growth?!)
Global GDP 140 trillion €

Distinctly more and more equal prosperity in developing and emerging countries / implementation of the SDGs

Composition of primary energy consumption:



Basic global roadmap scheme

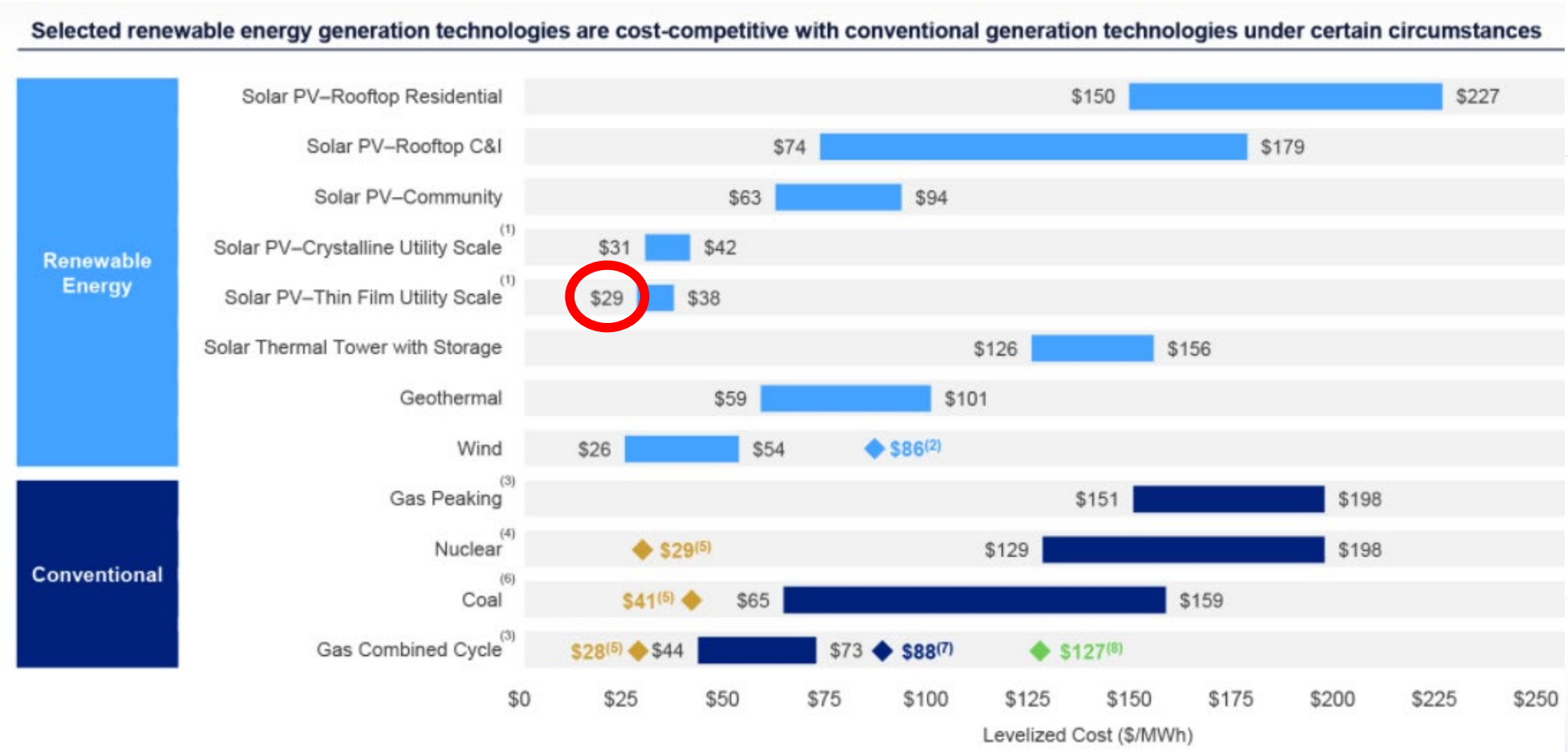


Cost structure

If electricity is available for 2 Cent/kWh with the process of electrolysis, the following cost for synthetic fuels (including taxes) result:

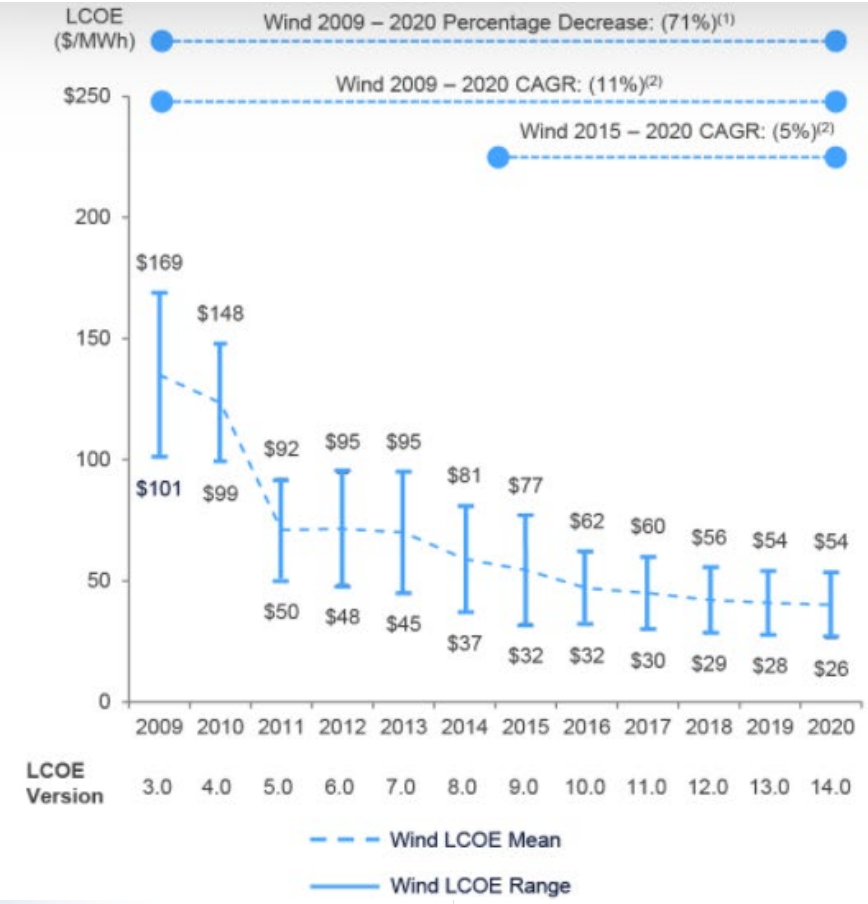
1.	Cost of green hydrogen	1 Euro per kilo
2.	Cost of green methanol (Europe)	350 Euro per ton
3.	Cost of green methanol (Africa)	250 Euro per ton
4.	Cost of green methanol when used as fuel	1 – 1.20 Euro per double litre, incl. VAT
5.	Cost of green methanol-gasoline	1.70 – 1.90 Euro per litre
6.	Cost of green methanol-diesel	1.80 Euro per litre
7.	Cost of green methanol-kerosene	1 Euro

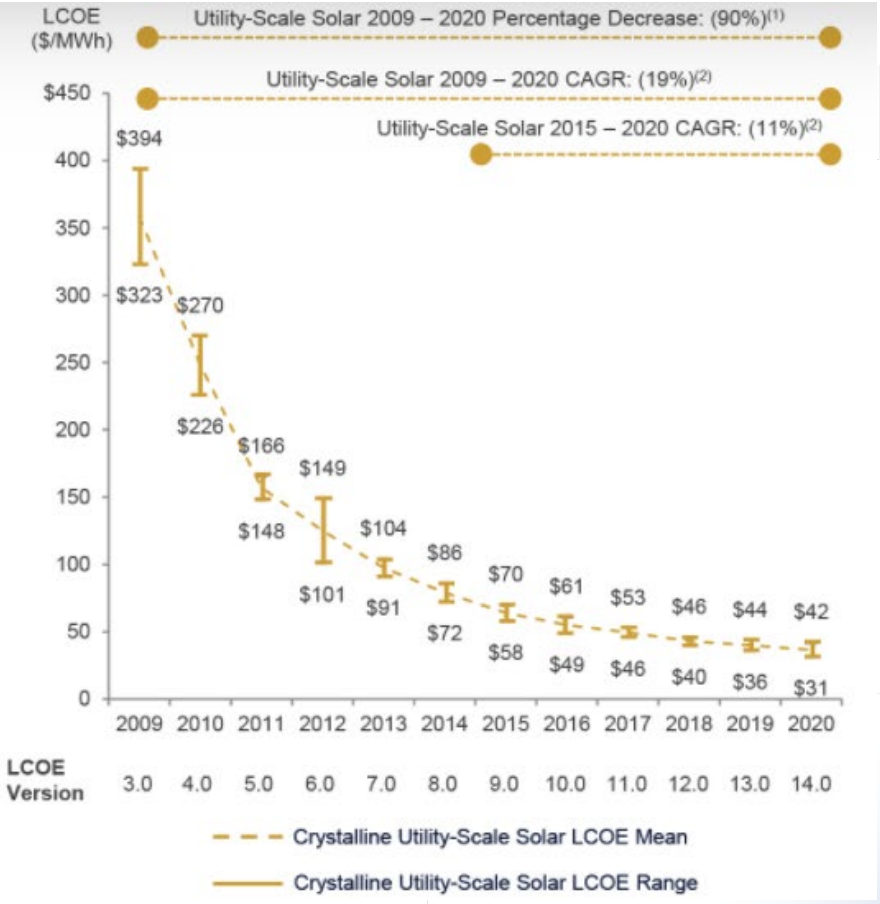
Lazard's cost of energy analysis (October 18, 2020)



29 US$ per MWh ~ 2,4 Euro cents per kWh

Trends of wind and solar energy costs





Source: Lazard, 2020

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Potential benefits of suggested approach

- Achieve CO_2-neutrality (via “carbon recycling“)
- Maintain rainforests (financed by developed countries)
- Soils to be kept in good order (carbon storage)

- Produce food for all mankind (reverse desertification)
- Marshall plan for Africa (create there 20 million jobs p.a.)
- Avoid two-tier society in Europe (less migration)
- Reduce global inequity (development of poor areas)
- Stabilise world population to 10 billion

- Help industry survive (especially conventional energy)
- Reduce the probability of world economic crises
- Avoid economical stifling of individual countries
- Prevent international tensions
- Contribute to achieving all SDGs

Thank you for your attention!

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