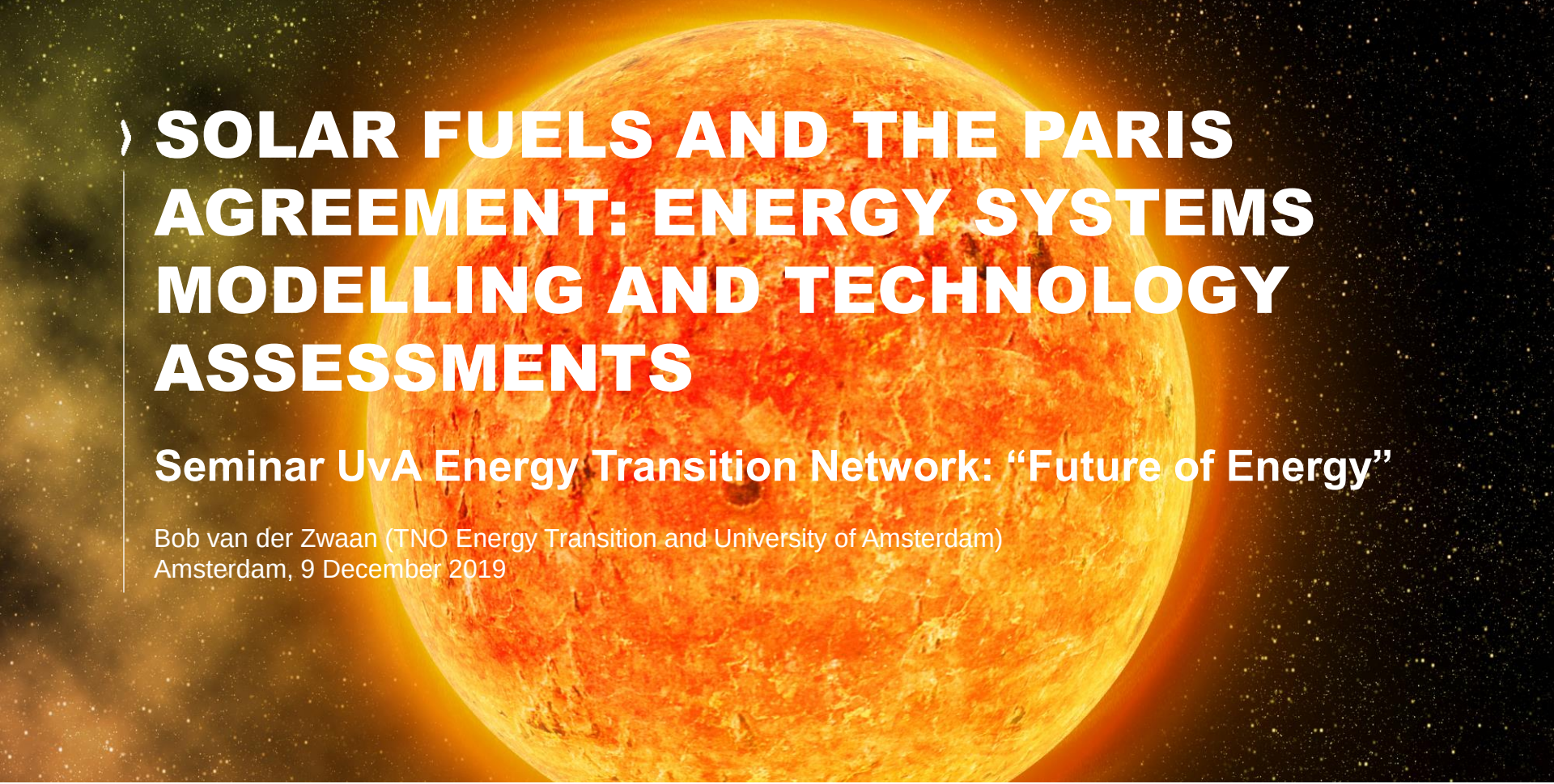
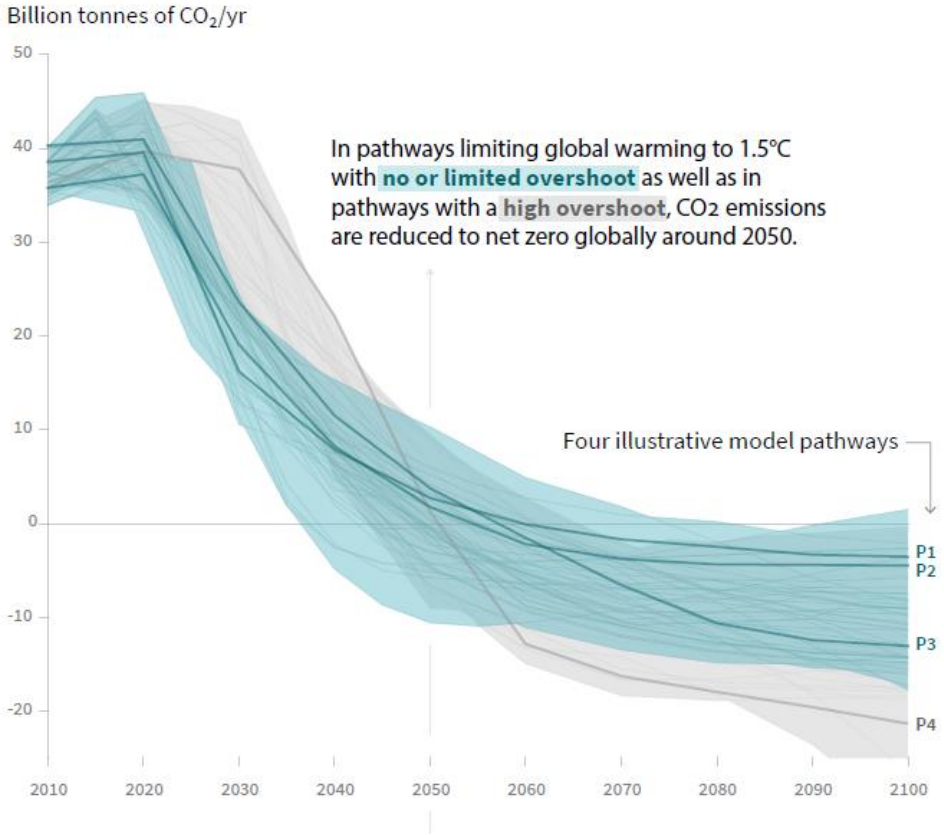


SOLAR FUELS AND THE PARIS AGREEMENT: ENERGY SYSTEMS MODELLING AND TECHNOLOGY ASSESSMENTS

Seminar UvA Energy Transition Network: “Future of Energy”

Bob van der Zwaan (TNO Energy Transition and University of Amsterdam)
Amsterdam, 9 December 2019

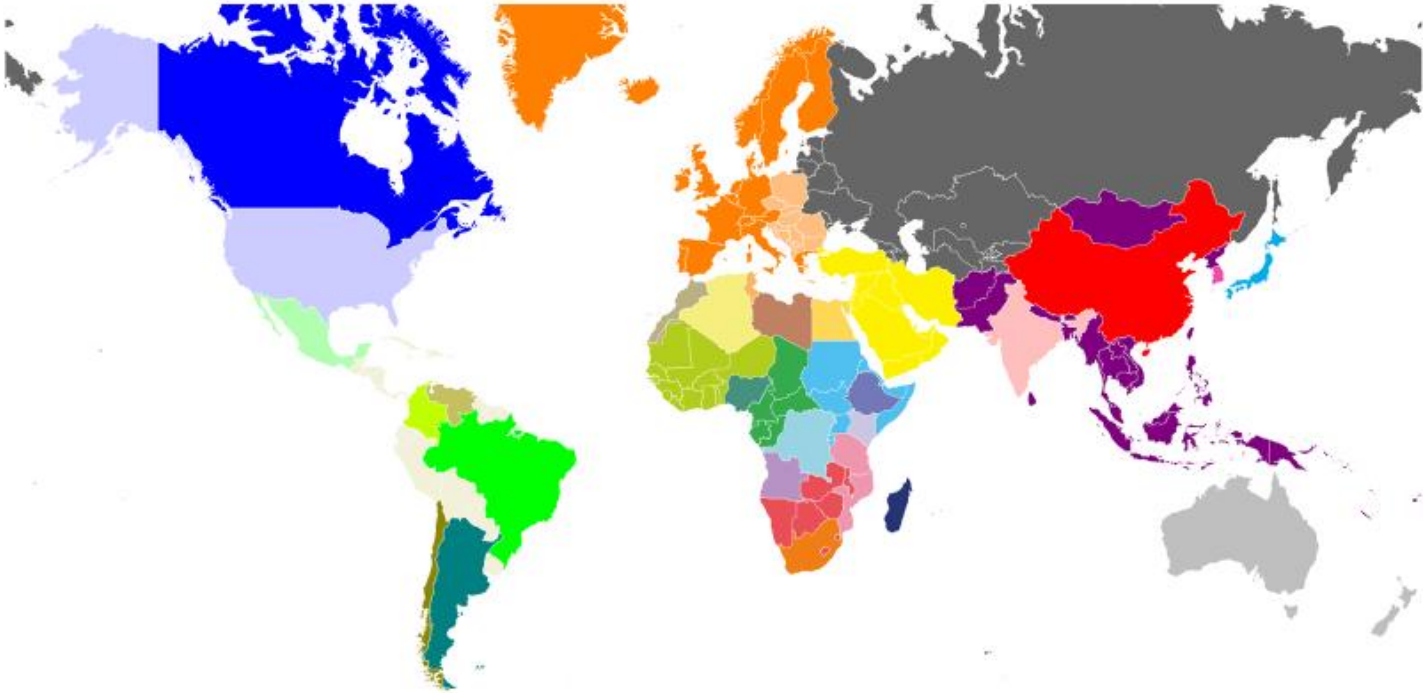
GLOBAL NET CO2 EMISSIONS



Around 2050 we should have net zero CO_2 emissions, and after 2050 we need to realize negative CO_2 emissions … !

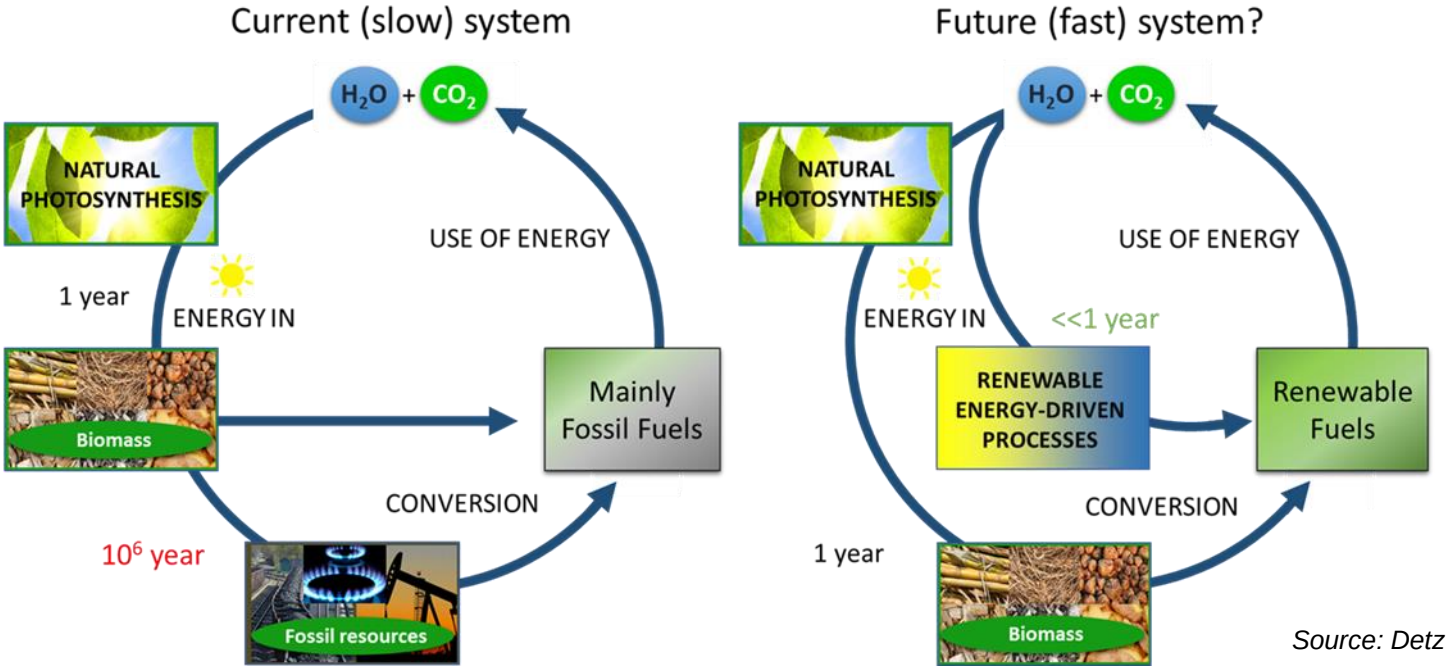
Source: IPCC SR "1.5 °C", 2018

GLOBAL SCENARIOS MODEL: TIAM-ECN



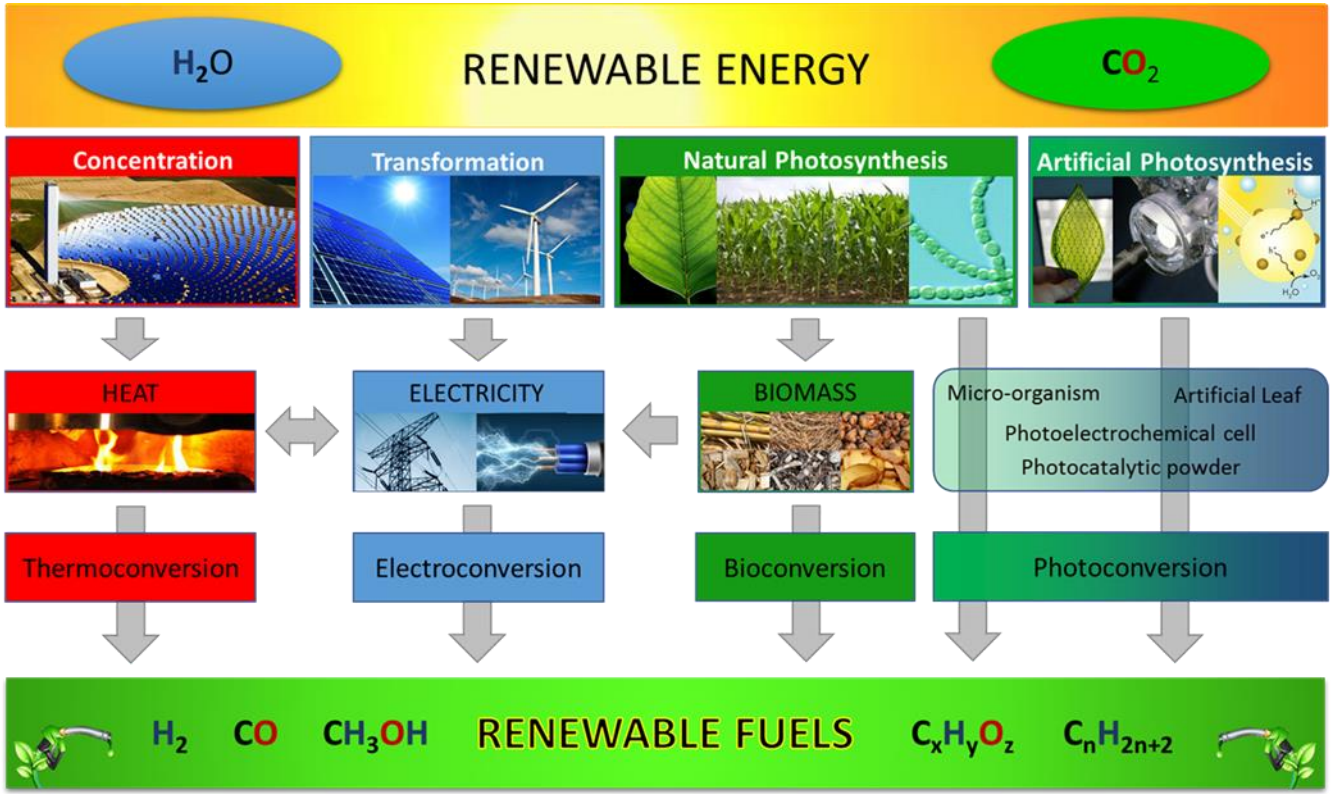
TIAM-ECN is an optimization model of the global energy system and serves analyzing how to reach the 2°C target of the Paris Agreement.

RECYCLING CO2



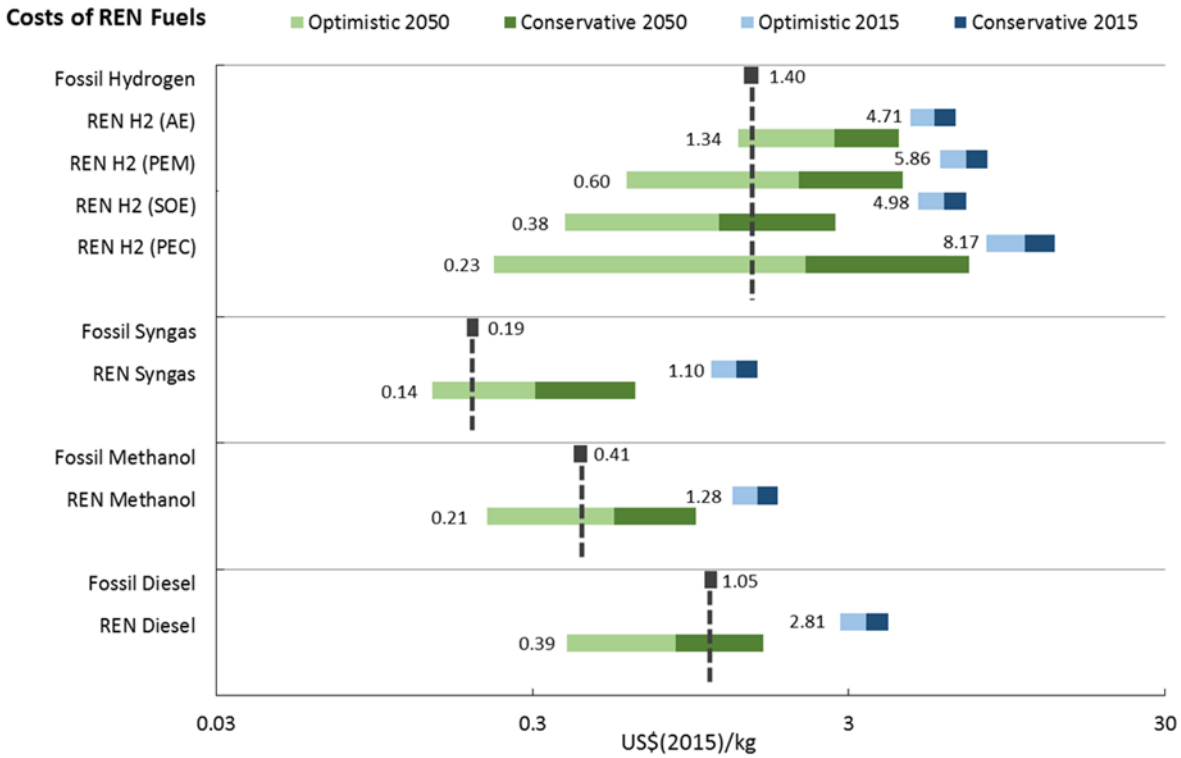
Source: Detz et al., 2018

SOLAR / RENEWABLE FUELS



Source: Detz et al., 2018

COMPETITIVITY OF SOLAR FUELS

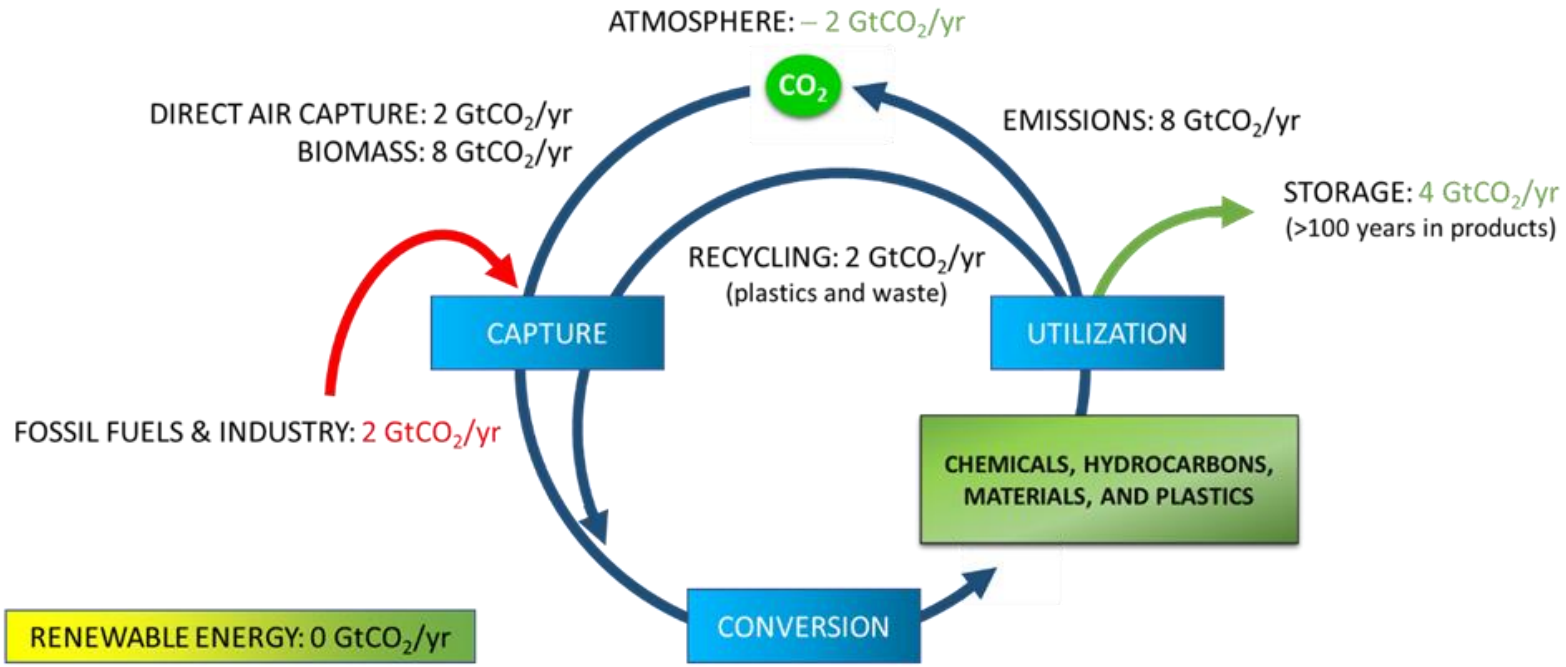


Learning-by-doing will strongly reduce the costs of solar fuel production.

Assuming learning curves for key components, we conclude that competitive break-even can be reached in about 20 years.

Source: Detz et al., 2018

RECYCLING CO_2



Source: Detz and van der Zwaan, 2019.

REST OF THE WORLD: AFRICA

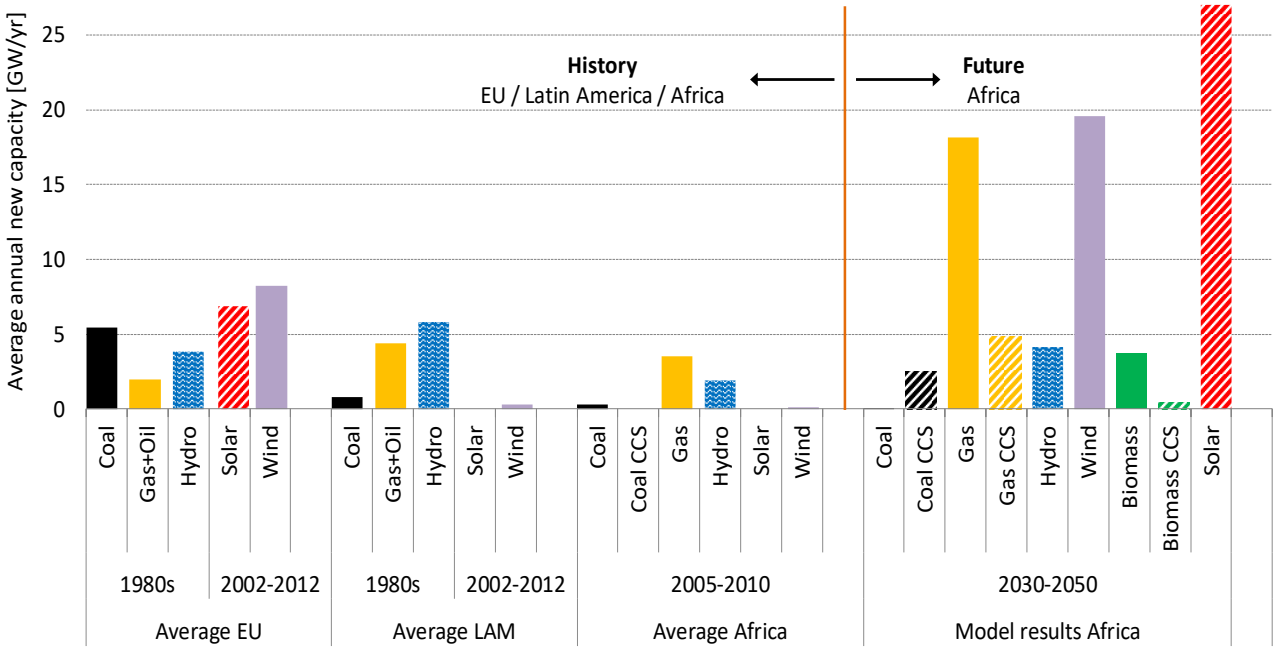
- It is tempting to inspect the energy transition from a national perspective, but the majority of critical developments occur outside the Netherlands (examples abound: PV panels, hydraulic fracking, nuclear power).

Africa may be the “new China”, and closer to home:

- In Africa population is likely to double between now and 2050.
- Economic growth is high in many African countries (5-10%).
- Current energy system is under-developed (100 GW for Sub-Sahara).

- This raises challenges, e.g. in terms of the possible carbon footprint…
- … but also opportunities for renewables, including for Europe.

CAPACITY ADDITIONS



Source: TIAM-ECN; van der Zwaan et al., 2018

Electric power capacity additions: past for Africa, EU and Latin America, and prospects for Africa under a “Paris Agreement” 2ºC scenario

CLIMATE CHANGE: FINAL REMARK

"We have to manage the unavoidable, and avoid the unmanageable."

John P. Holdren, IEW 2017, University of Maryland

At **TNO Energy Transition** we aim at precisely that:

Changing our energy system so as to achieve net zero-CO_2 emissions by mid-century to avoid unmanageable climate change.