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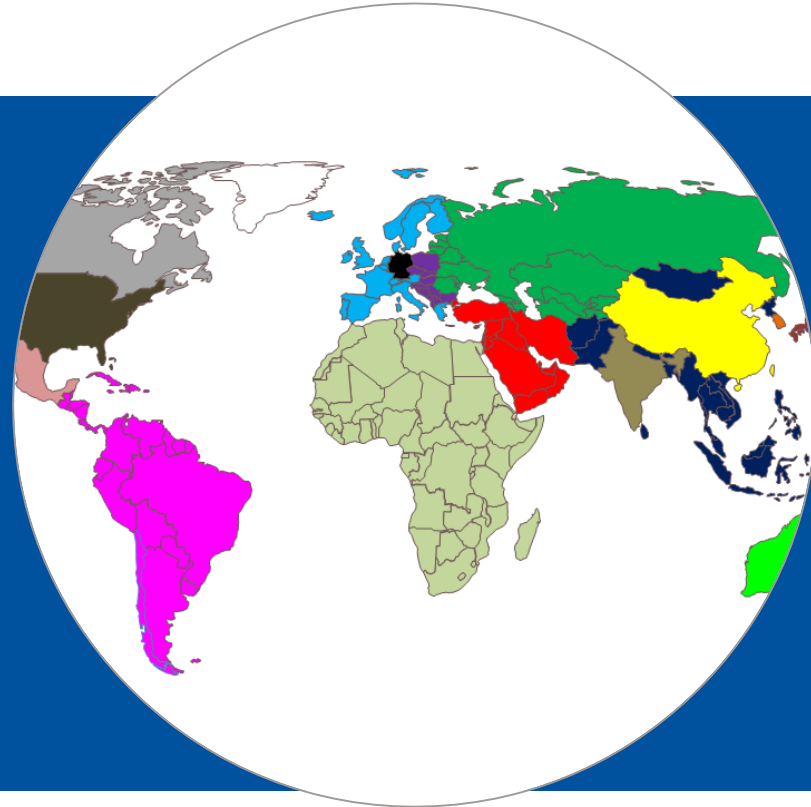
IER Institut für Energiewirtschaft und
Rationelle Energieanwendungen

The impact of the Paris Agreement on German energy system – When do we achieve the net zero target in Germany

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ETSAP WS

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Motivation

- The Paris Agreement will in the long term determinate the German GHG reduction target or budget
- Analysis impact and possibilities of Germany to benefit from cost efficient GHG reduction measures in other world regions.
- Under which circumstance can, when and how achieved a net zero emission level in Germany
- Describe in a techno economical way of energy, GHG and resource balance possibilities through the trade with other regions.

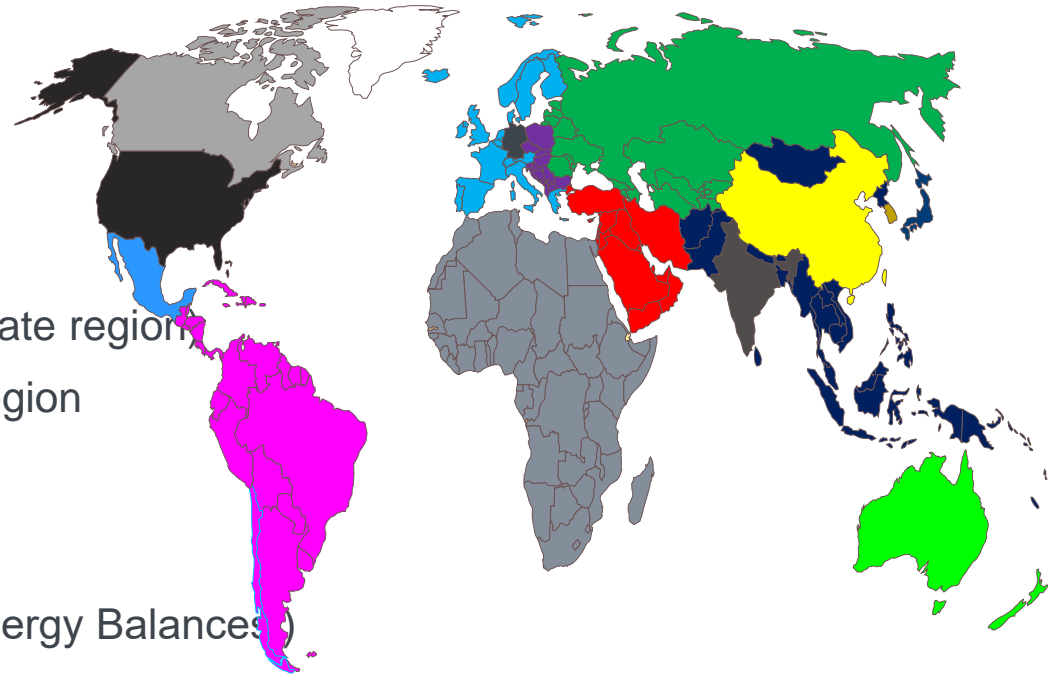
Current discussion related GHG reduction targets in Germany

- **Klimaschutzplan 2050 (Climate protection plan)** with emission reduction targets compared to 1990 ("sector targets")
- **For the transformation sector** (public electricity and heat generation, refineries, other transformation), the achievement of the sector target is **not a binding requirement**.

Sector \ Year	2030	2050
Buildings	-65%	-94%
Transport	-40%	-90%
Industry	-49%	-81%
Agriculture	-34%	-89%

TIAM-IER

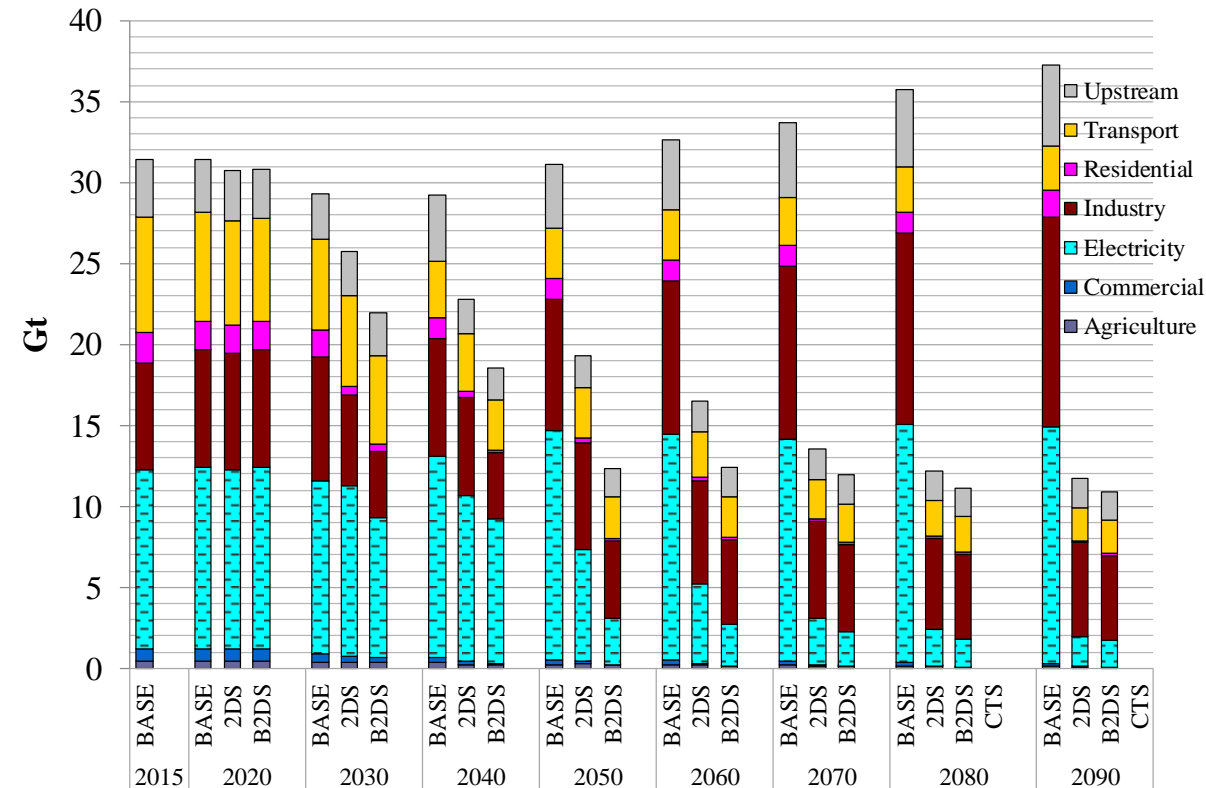
- Based on ETSAP TIAM
- structure:
 - 16 world regions (Germany as an separate region)
 - up to 42 energy service demands per region
- 2019 update:
 - Base year 2005 → 2015 (,IEA World Energy Balances)
 - Update region specific emission factors to hit the emission balance 2015
 - Update the biomass potential and conversion chain
 - Update the heating market
 - 12 time slices (as an intermediate step)



Scenario definition

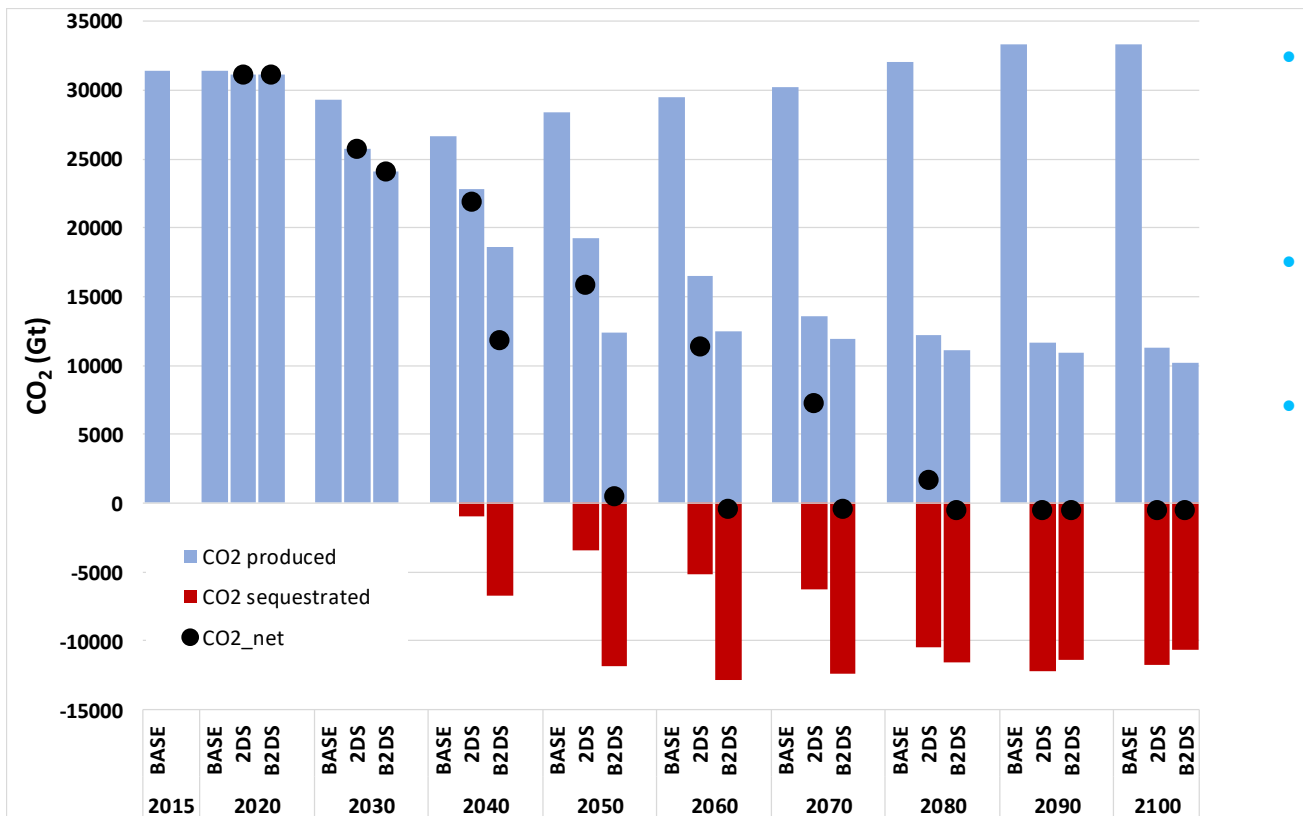
- Base:
 - Minimum use of renewables based on WEO2018
 - Taking into account the current situation related coal fired plants plants till 2040
- 2DS:
 - Carbon Budget starting 2020: 1140 Gt
 - CCS after 2030 commercial available
 - Minimum use of renewables and fossil-decline according to Base
- B2DS:
 - Carbon Budget starting 2020: 600 Gt
 - CCS after 2030 commercial available
 - Minimum use of renewables and fossil-decline according to Base

Scenario comparison CO2 Emission World



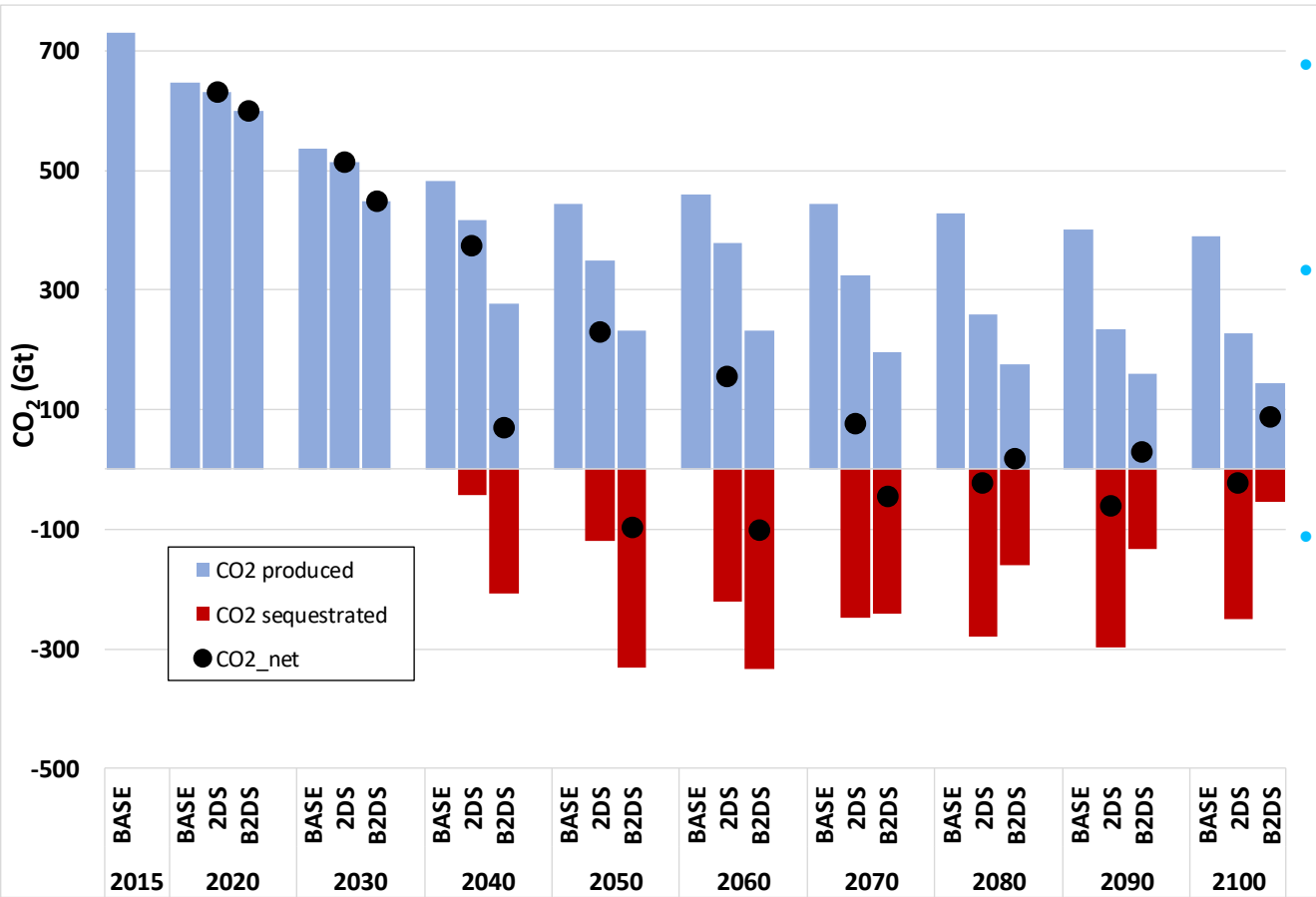
- Till 2100 will be still CO2 emissions coming from the industry (process emissions) without material chances
- The different between the Budget scenarios is in the middle period and not at the end of the century
- It might be still economical to have some emissions for example in the Electricity sector

Scenario comparison net CO2 Emission balance World



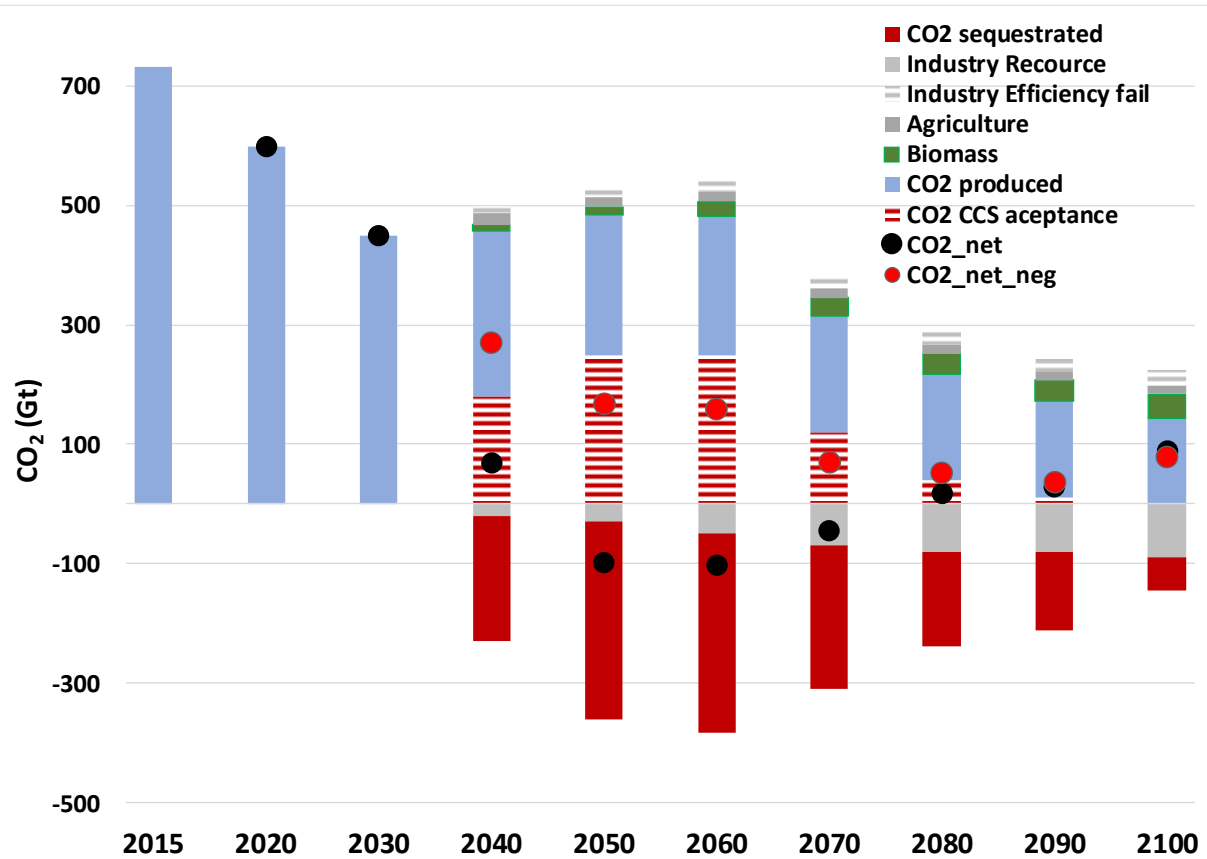
- In the 1.5 °C scenario we already achieve in 2050 net zero emissions.
- This is based on negative emissions from BECCS
- In the long term after 2080 also the 2°C scenario have net zero emissions.

Scenario comparison net CO₂ Emission balance Germany



- In the 1.5 °C scenario Germany has to achieve in 2050 net negative emissions.
- In 2°C scenario Germany has more or less a linear reduction till 2080 to achieve net zero emissions.
- But do we have the acceptance for CCS, the quantity of Biomass, the ...?

1.5 °C scenario CO₂ Emission balance Germany taking into account acceptance and challenges



- Without any additional measures we get problems to achieve the net zero emissions
- The main critical path seems to be the possibility to use CCS
- It causes additional delay's in achieving the climate target.
- Additional acceptance problems might coming up – for example for onshore wind

Conclusion and outlook

- The GHG target of an Country might depend very much from the overall target and the additional politics but also the technology development and the acceptance of the use
- The energy system analysis have to take more and more social circumstances into account. It isn't any more only a question of economically technology availability it is for example also a question of life style...
- To take into account the acceptance of a technology mix in a scenario it's necessary to include additional indicators like land use, resource consumption and efficiency but also social behavior ...