

**Eliminating all CO2 Emissions in Austria by 2040?  
A Sketch of the Challenge ahead**

*Johannes Schmidt (BOKU University)*

*Young Academy - Science Day – 23.9.2022*



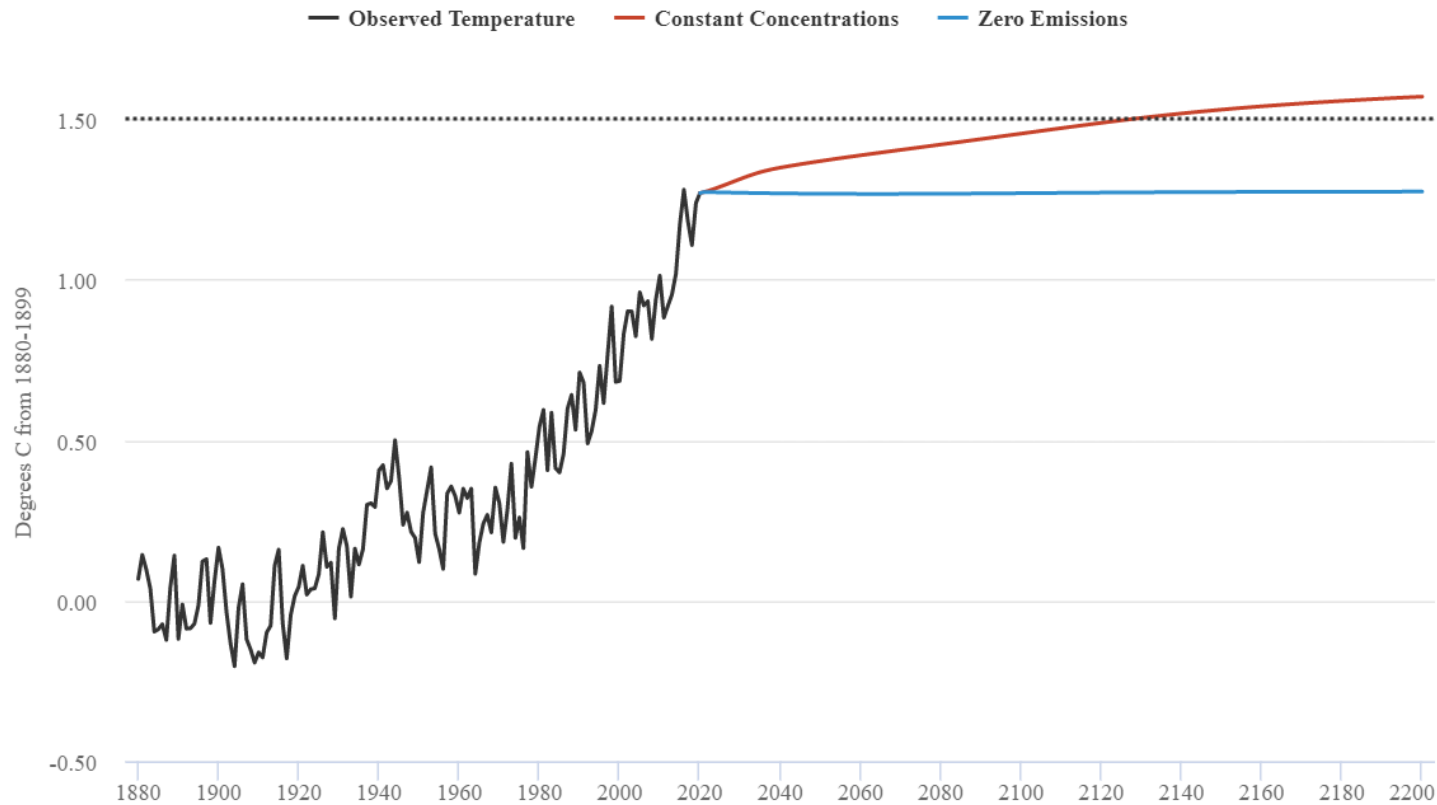
**NET  
ZERO  
2040**

# Why netZERO?



Global warming is expected to stop once CO2 emissions reach net-zero

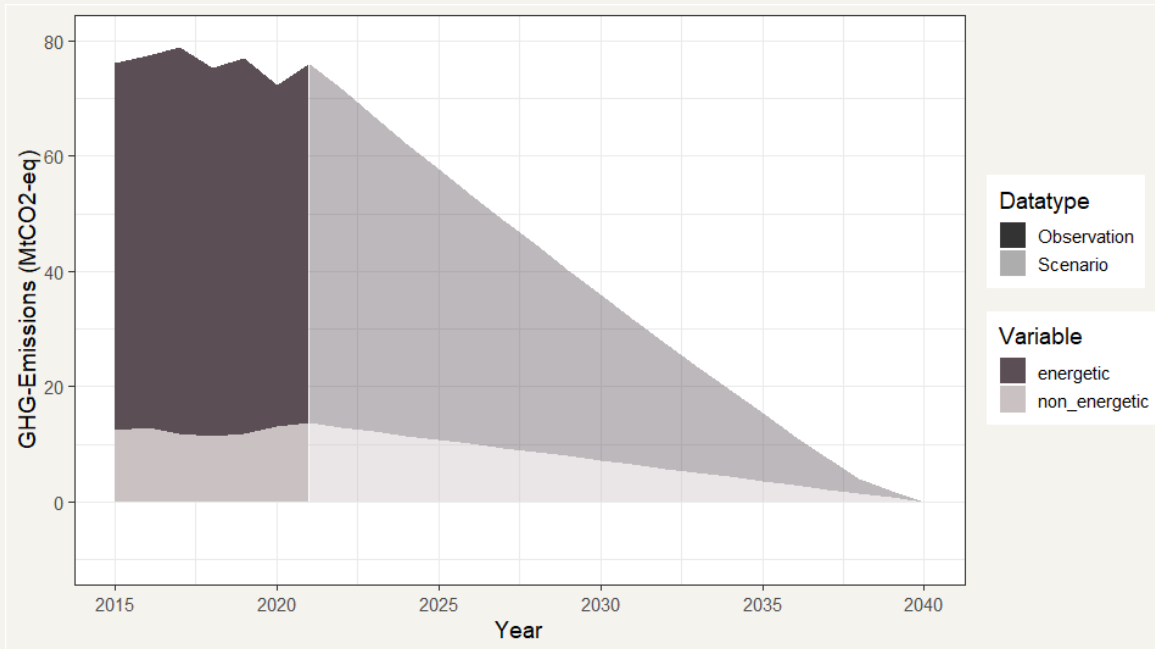
But constant concentrations would result in continued warming



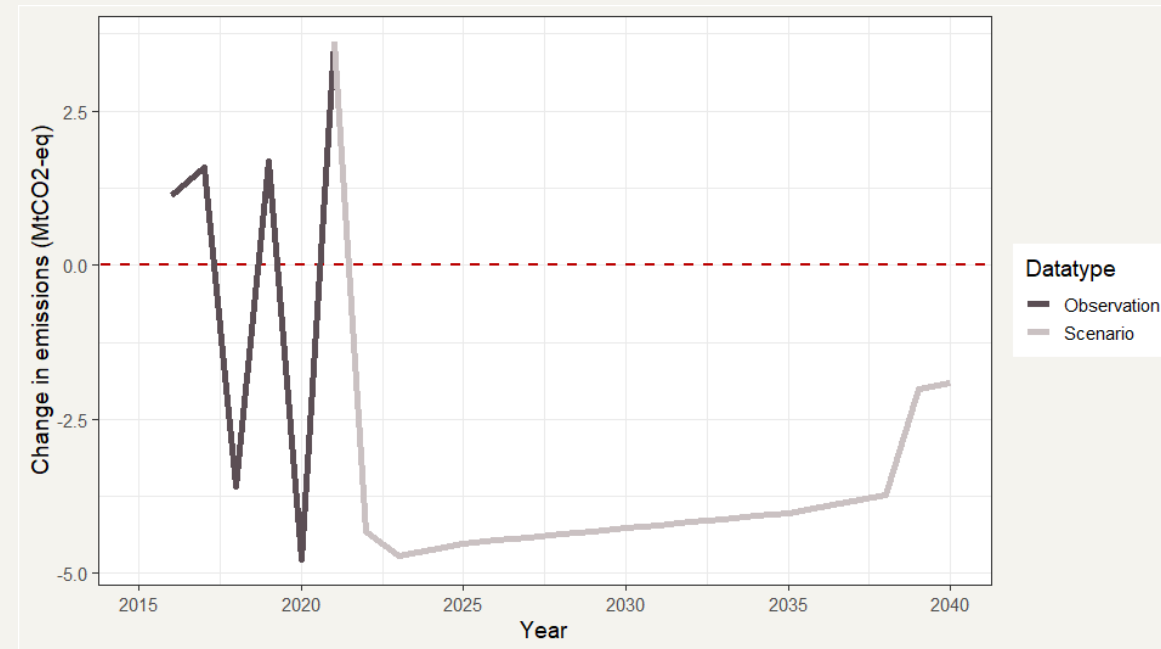
Source: Carbonbrief <https://www.carbonbrief.org/explainer-will-global-warming-stop-as-soon-as-net-zero-emissions-are-reached/>

# The Austrian 2040 goal compliant with the 1.5° limit

Total emissions

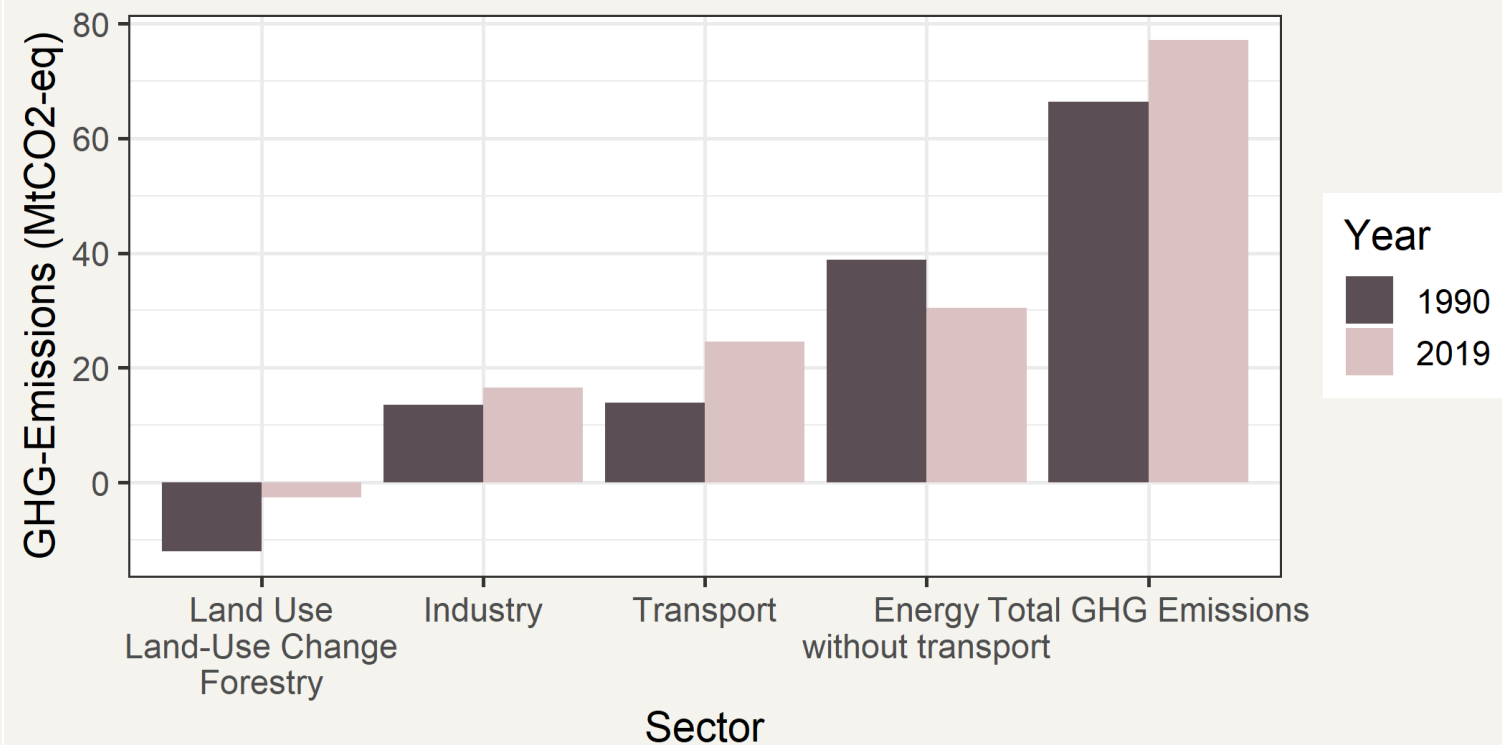


Change in emissions



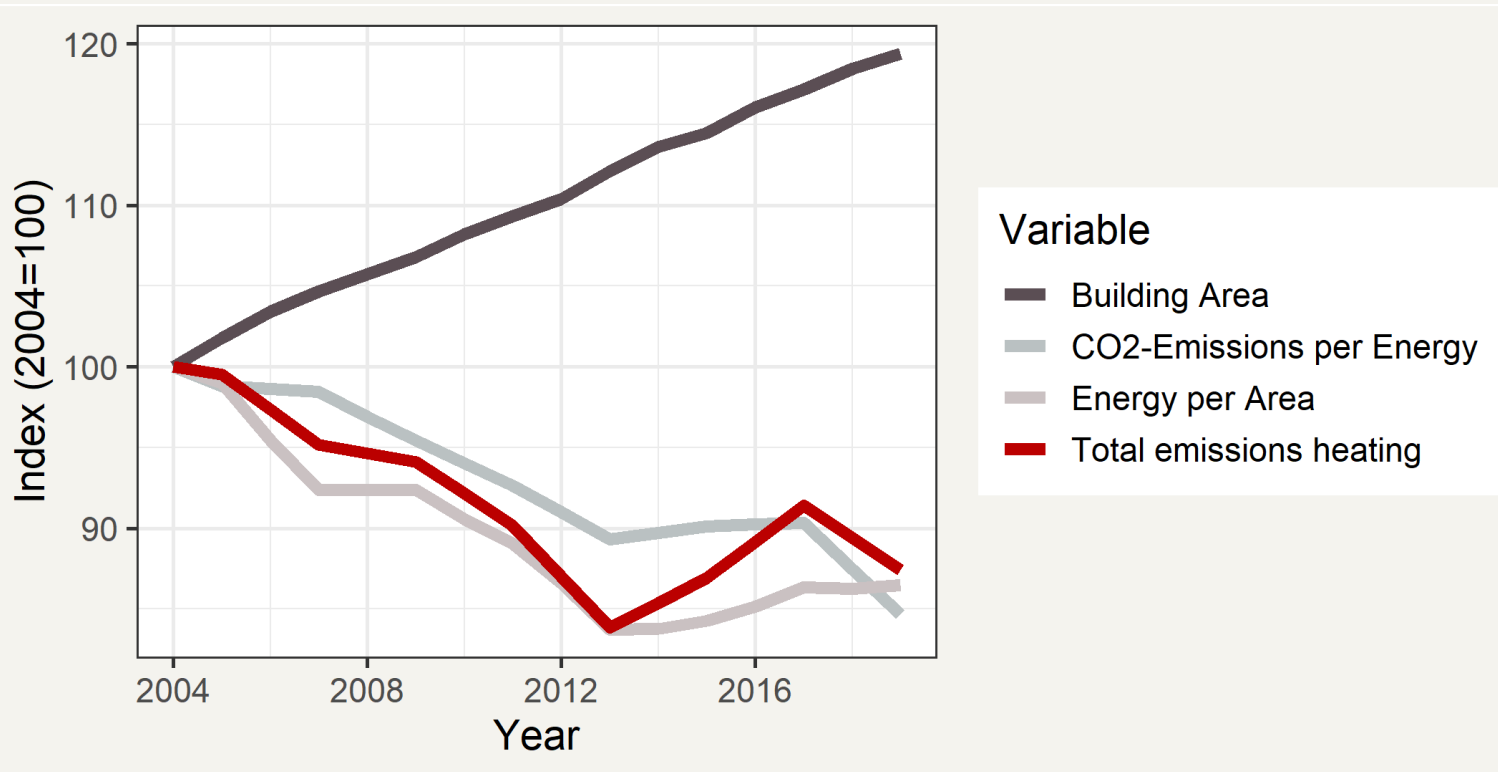
Source: Steining, Kirchengast (2021).  
 Treibhausgasbudget für Österreich auf dem Weg zur Klimaneutralität 2040.  
<https://wegcloud.uni-graz.at/s/ezopLM6ycRk8Txo>  
 + own analysis

# Austrian greenhouse gas emissions by sector



# 3 options to reduce emissions

Example: private heating sector



**Reduce service level: less living area**

**Increase energy efficiency: e.g. better insulation**

**Reduce carbon intensity: e.g. heatpumps + renewable energy**

**Period 2004-2019:**

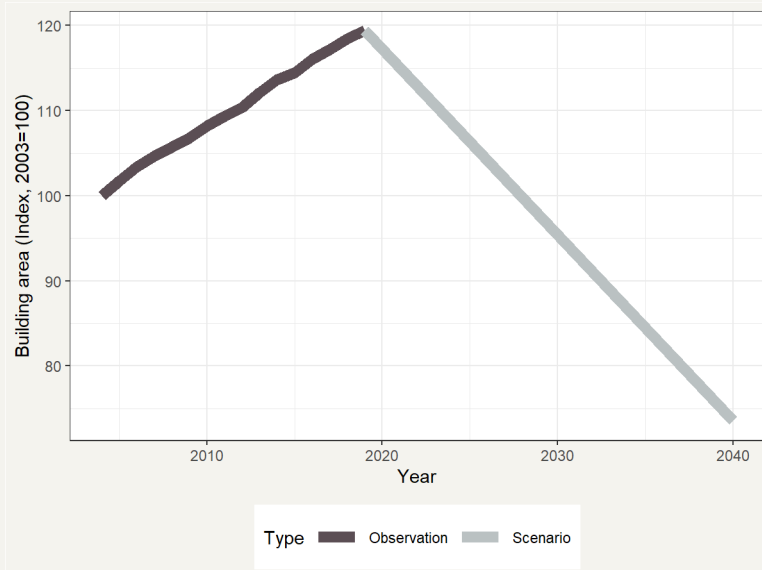
- **Increase in service level (~+13%)**
- **Decrease in energy intensity (~-13%)**
- **Decrease in carbon intensity (~-20%)**
- **Decrease in emissions (~-17%)**



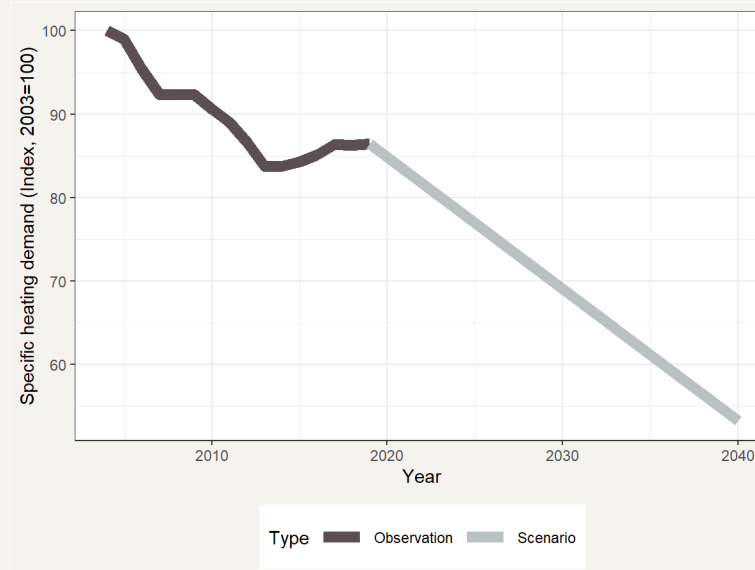
# 3 ceteris paribus scenarios for getting to 0 emissions by 2040

Example: private heating sector

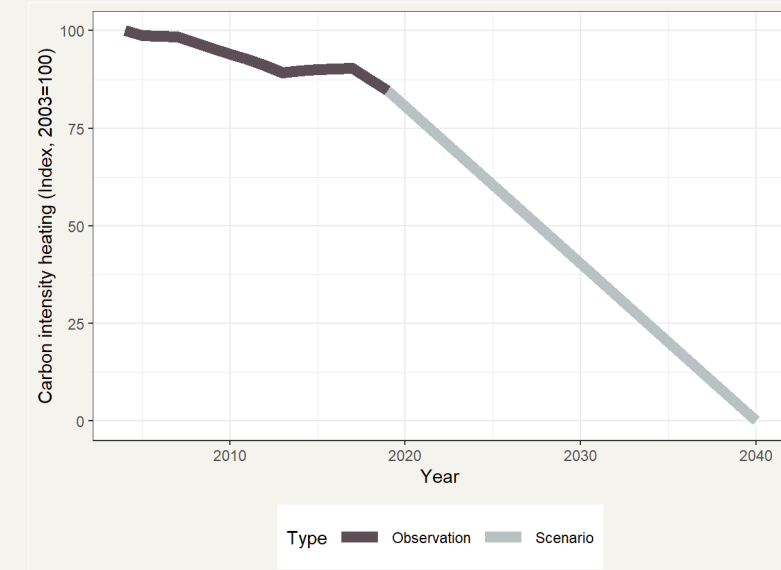
### Sufficiency (from 45m<sup>2</sup>/capita to 27m<sup>2</sup>/capita)



### Room temperature & Efficiency (from 134kWh/m<sup>2</sup> to 53kWh/m<sup>2</sup>)



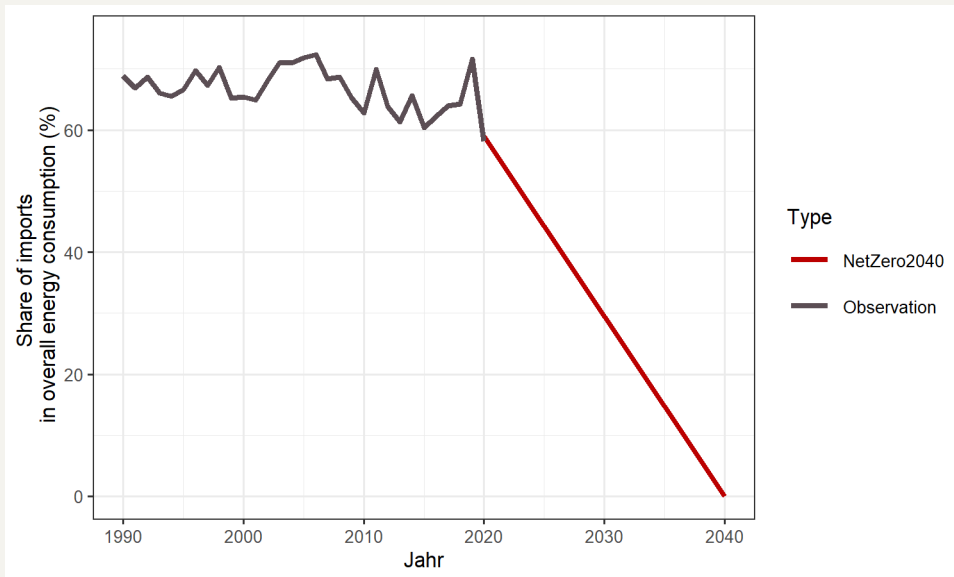
### Decarbonization (from 152gCO<sub>2</sub>/kWh to 0gCO<sub>2</sub>/kWh)



# Challenge energy supply

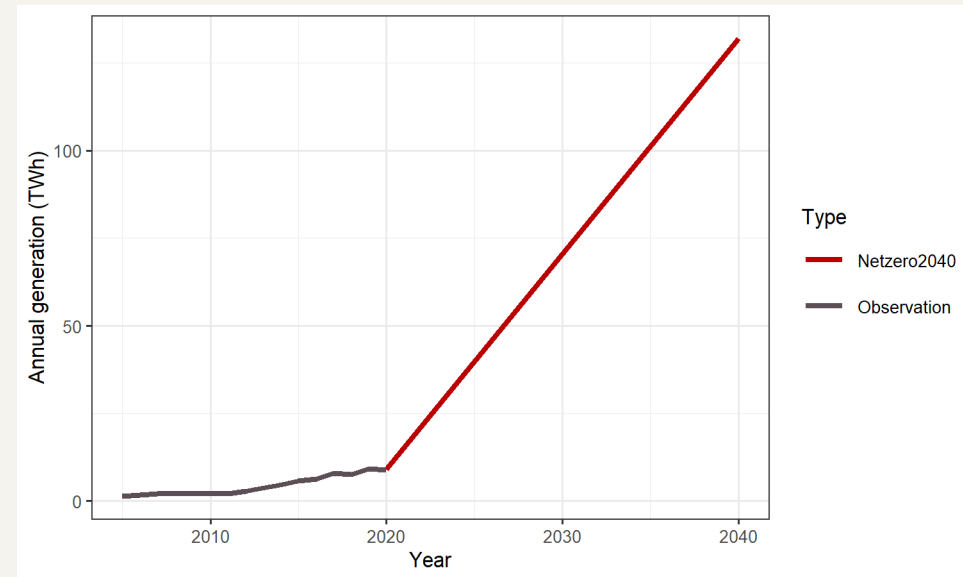
High import shares & very high speed necessary

## Import share



Low-carbon fuel carrier imports very limited in coming 2 decades due to **cost, speed of expansion, carbon opportunity cost**

## PV + wind power expansion



Past trends are **insufficient**. In 2040, renewable electricity generation has to be expanded 4 \* the amount currently foreseen until 2030.

# Drivers of decarbonization

## Renewable & low-carbon energies

- Massive cost declines of renewables & low carbon technologies
- Innovative technologies
- Most scenarios globally see netzero cheaper or at equal cost level than the fossil fuel counterfactual
- But beware: low-carbon energy system costs are increasingly driven by integration cost.

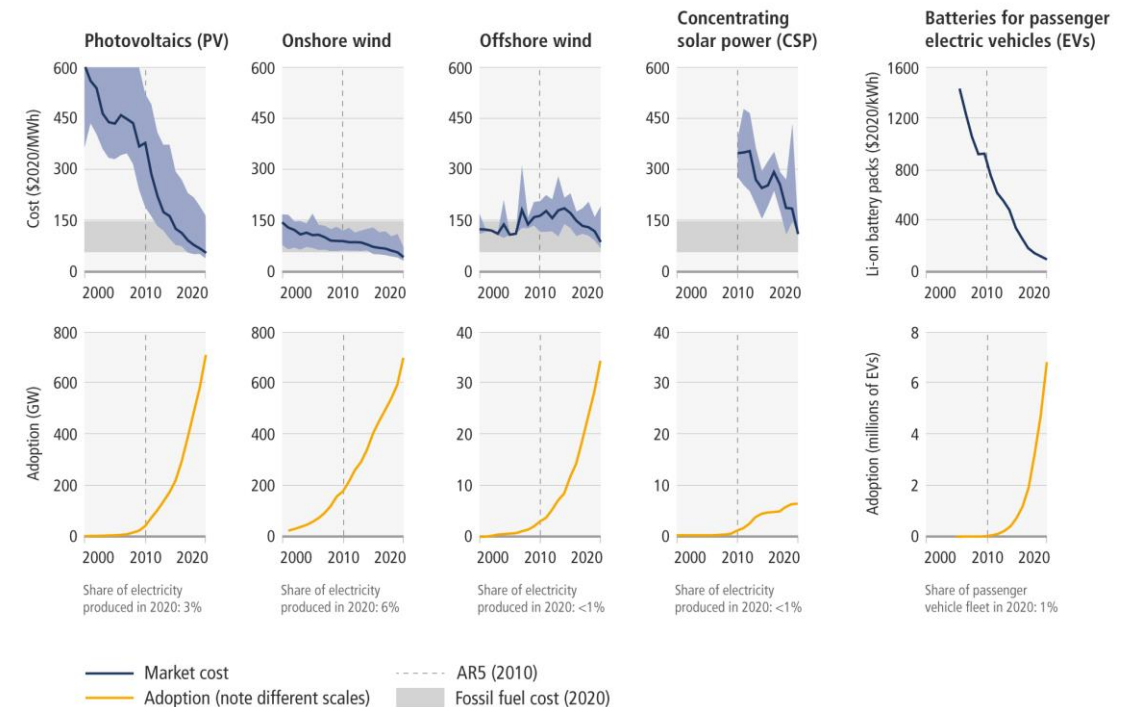
## Political agenda

- Commitments to stringent decarbonization goals globally (e.g. China)

## Geopolitical situation

- Going low-carbon in Europe also increases security of supply, which is a major concern today

The unit costs of some forms of renewable energy and of batteries for passenger EVs have fallen, and their use continues to rise.







# Barriers to the transition

## **Bottlenecks in**

- Supply of equipment & of skilled labour
- Resources, efficiency & coordination of municipal, state, and federal administration (Quality of procedures?)
- Infrastructure expansion (particular electric grid)

## **Acceptance and Just Transition**

- Shift in benefits and costs in terms of jobs, income, landscape quality, etc. between households, companies and sectors
- These impacts have to be at the core of policy making (current discussion on energy prices!)

## **Policy making**

- Stringent targets, but much less stringent policies

## **Lock-in effects: Investment decisions today are very relevant in terms of reaching netzero**

- There may be still time to buy a combustion-engine car (10-15 years lifetime), but there is no time left to install a fossil heating system (20-30 years lifetime)

# The energy crisis & the energy transition

## Significant energy price increases (Factor 10)

### Short-term consequences for climate policy

- Demand down: Recession (-emissions)
- Coal up (+emissions, but ETS!)
- Electrification more expensive

### Long-term consequences for climate policy

- Economics of netzero scenario much better now
- Investments: overall investment climate worsening, but specific investments increasing (if policy does not intervene wrongly)
- More rapid transition envisioned (EU level, Germany, ...)
- High energy prices & recession: how will this play out politically in European democracies?





# Conclusions

**Reaching netzero emissions is economically & technically feasible**

**The speed of the transition, is however, unprecedented: past trends are only partly sufficient to reach netzero by 2040**

**How to deal with imported energy carriers is crucial**

**The current energy price crisis may increase emissions in the short-term, but if policies and investment decisions are aligned with climate goals, it can massively speed up the transition**



# The project partners

---



AUSTRIAN ENERGY AGENCY



*Funding by the Austrian Klimafonds as part of the 13th Austrian Climate Research Programme (ACRP). Grant number KR20AC0K18182*

Thank you!



@NetZero2040,  
@joaoestrangeiro



www.netzero2040.at  
Johannes.Schmidt@boku.ac.  
at

A thick red arrow pointing downwards from the top right corner of the slide towards the 'NET ZERO 2040' text.

**NET  
ZERO  
2040**