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Young Energy Professionals

Storage and Networks

Wolfgang Richter & Bernhard Fürnsinn / Vienna 25.06.2019

Decarbonization pressure

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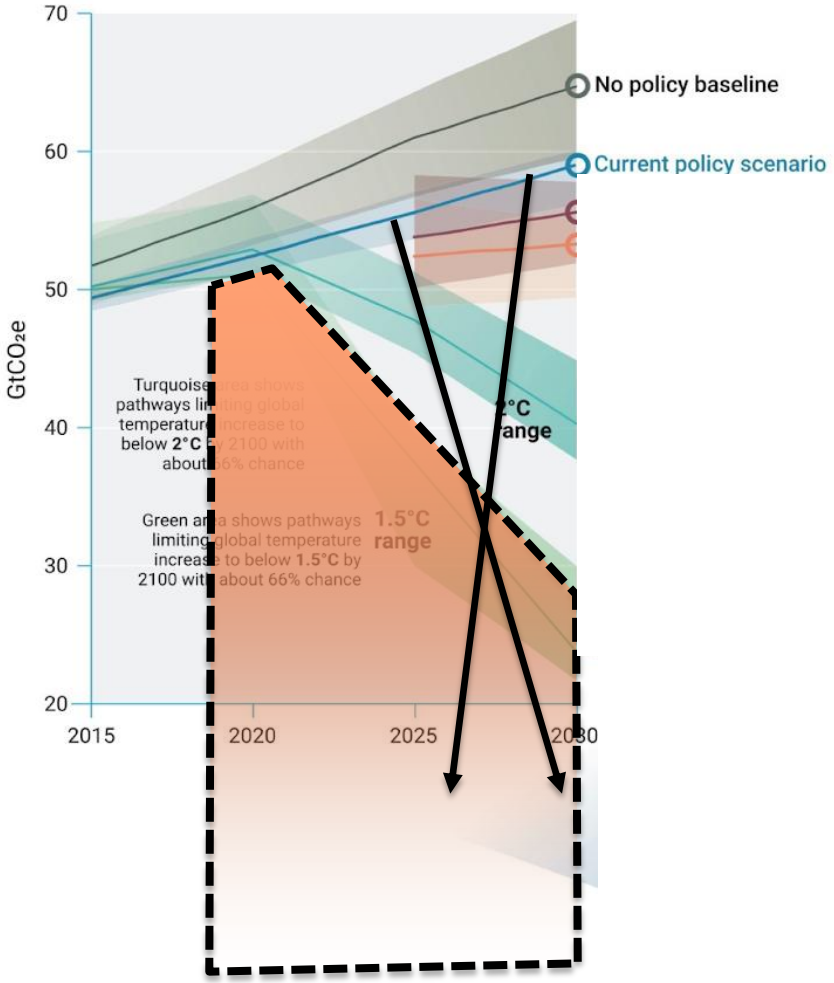
Figure ES.3: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and 10th to 90th percentile range).



FAST action!

→ Momentum

→ Challenges

→ Risk ↓

→ Chances ↑

UN environment Emissions gap Report 2018

Energy Transition

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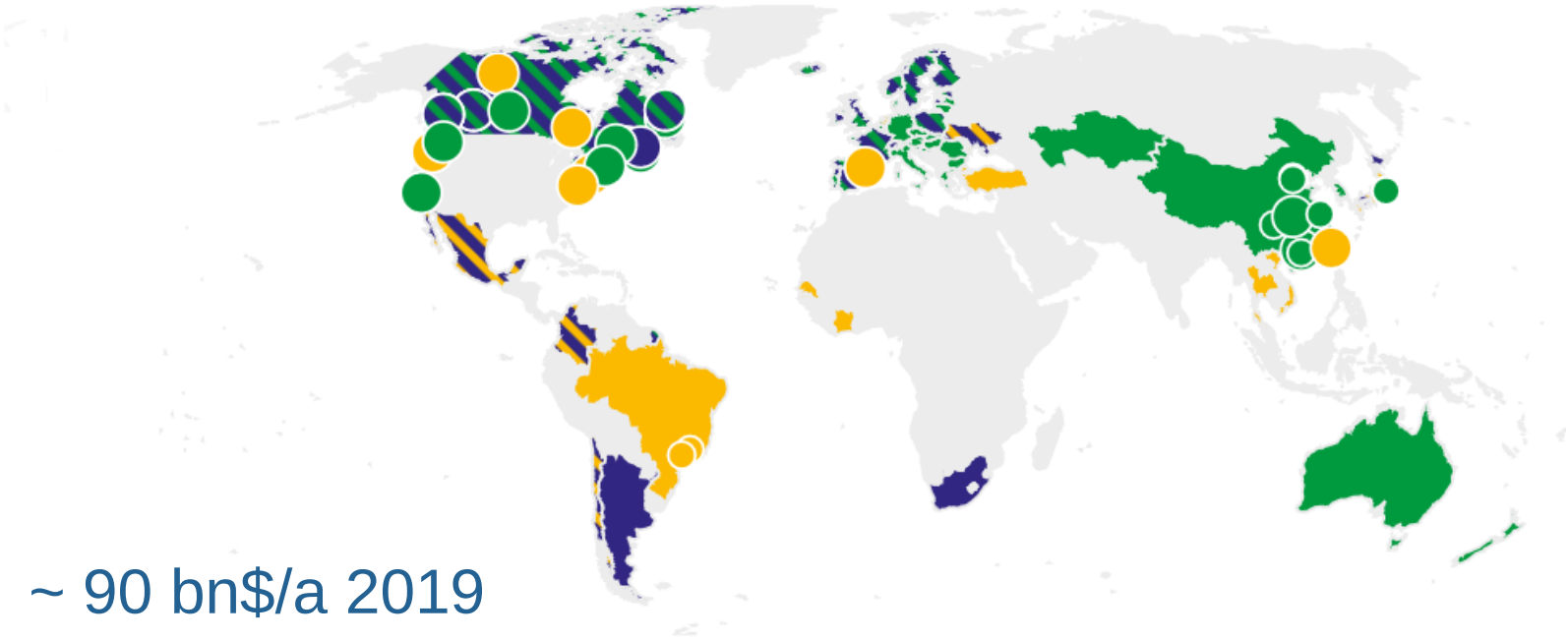
- Global, Carbon tax – Emission Trading System
- Pressure and new business cases



~ 90 bn$/a 2019

- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- ETS implemented or scheduled, tax under consideration
- Carbon tax implemented or scheduled, ETS under consideration

THE WORLD BANK

Energy transition - FUTURE

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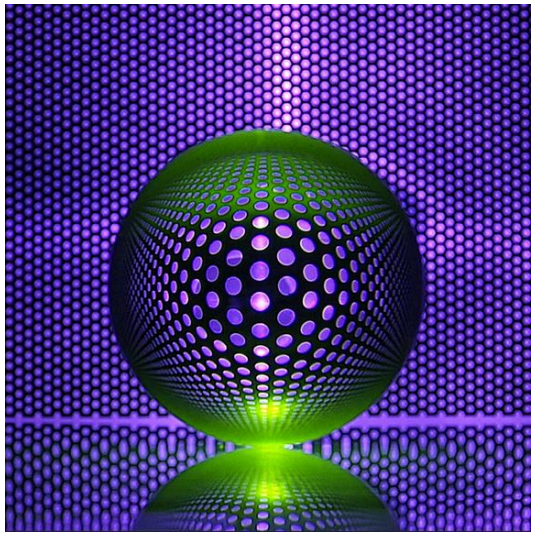
Prediction



picture: Angelika Fischer

or

Creation

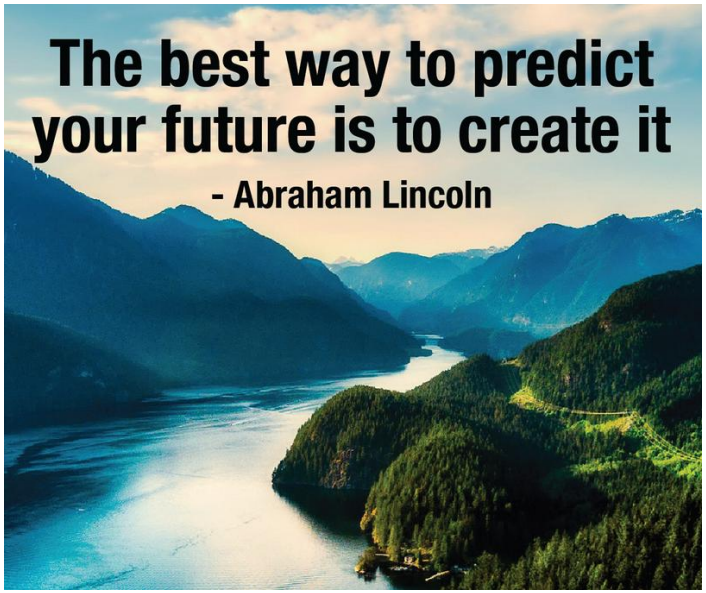


image: institutesuccess.com

Passive

Active

Energy System Transformation

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- Electric → **high efficiency**, long term infrastructure
- Sector-coupled

Transformation → **Storage and Network demand**

Substitution for Heat and Cold by Storage

- Combustion → **low efficiency,**
  - Fossile fuels
  - Oil → Transportation
  - Gas → Heat and Electric-peaking
  - Bio fuels

- Potential transition (Aviation, Industry….
  - Electricity-based synthetic fuels
  - Hydrogen economy

Future Proof investments

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- How to evaluate the future prospects of a storage system?
- General factors
  - EROI – Energy Return On Invested
  - ESOI - Energy Stored On Invested
  - Efficiency
  - LCOE/LCOS
  - Long lifetime
  - Low footprint of GHG
  - Low impact on environment

Prosperity & Stability

Detail solution finding approach

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- Renewable electricity, future needs of storage and grids
- Technology competition, ahead of large scale implementation
- Long term investments
- Infrastructure approach as a major basis of prosperity

- → interdisciplinary approach

- READ publications
- INTERPRETATE
- DISCUSS

→ Atlantis approach

Technology Decision Matrix (e.g. Storage)

Storage Technology	Round trip efficiency	Multy purpose	life time [a]	de-Carbonization	Critical resources import	Infrastrucure benefit	ESOI	Specific investment [€/kWh]	Specific investment [€/kW]	level of maturity	specific notes
A	<30 %		20								
B	80%		100								
C	90%		10								

System discussion

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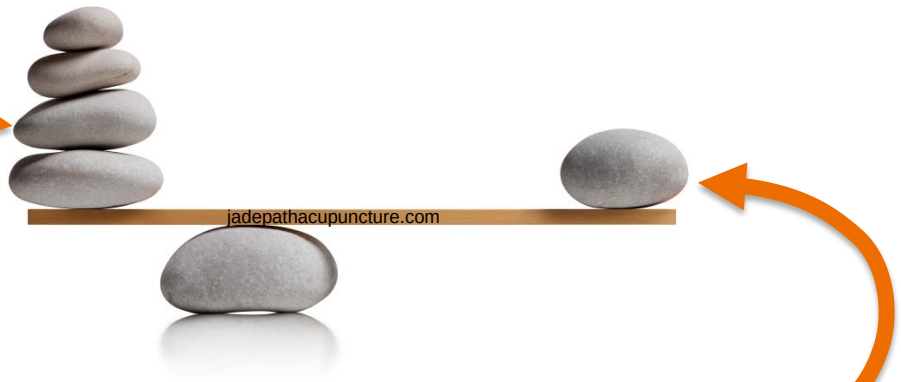
- **Decentralized system**
  - More grid integration
  - More small units of storage



- **Centralized system**
  - More grid integration
  - More large units of storage

→ Subsidies towards long term and economic system

Team

Diendorfer Christian

Fürnsinn Bernhard

Gartner Verena

Kahler Christopher

Marko Florian

Mayer Josef

Migglautsch Robert

Pikl Franz Georg

Pink Florian

Richter Wolfgang

Steidl Bernd

Weissensteiner Thomas

Wolkinger Doris

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Thank you

Bernhard Fürnsinn & Wolfgang Richter

UPH

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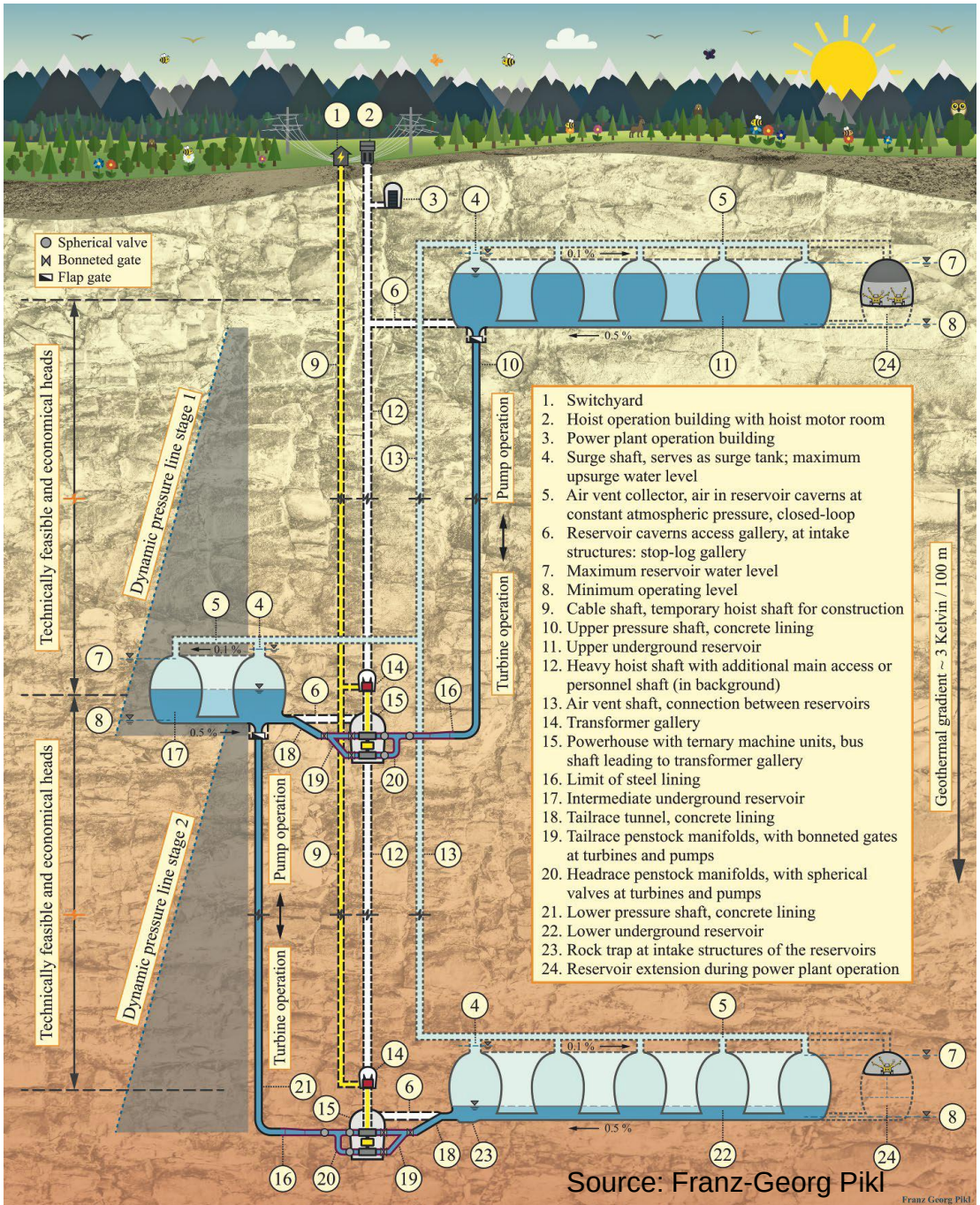

Underground Pumped Hydropower

Source: Franz-Georg Pikl

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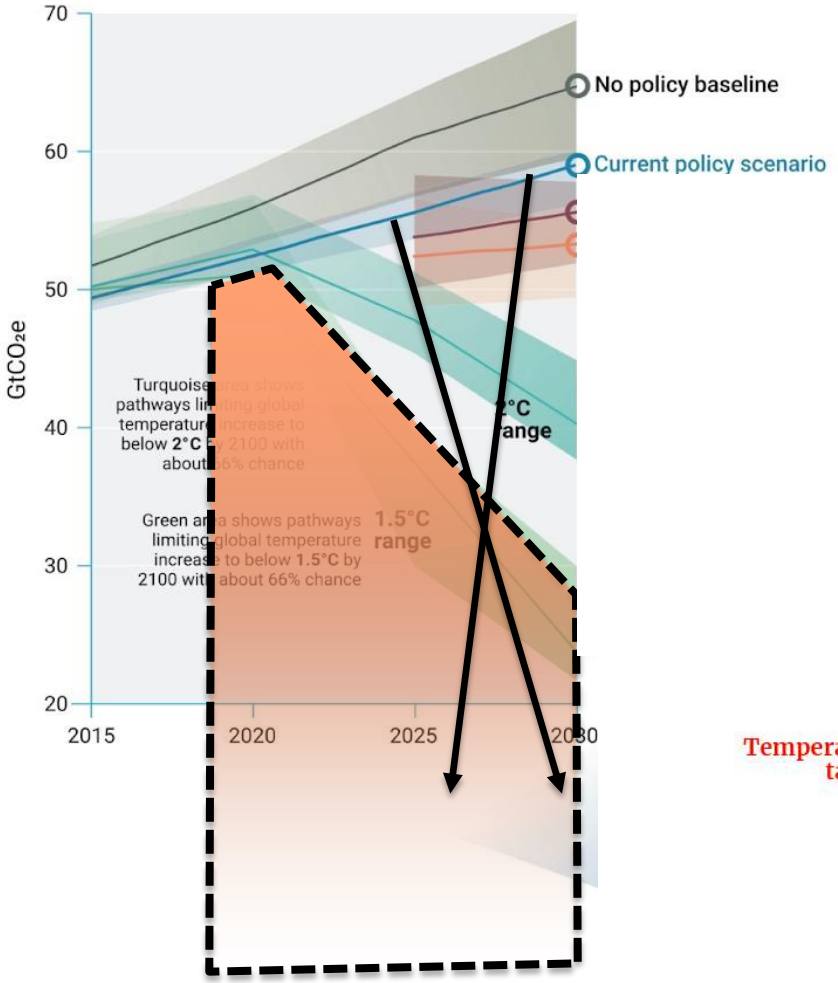

Emissions gap Report 2018

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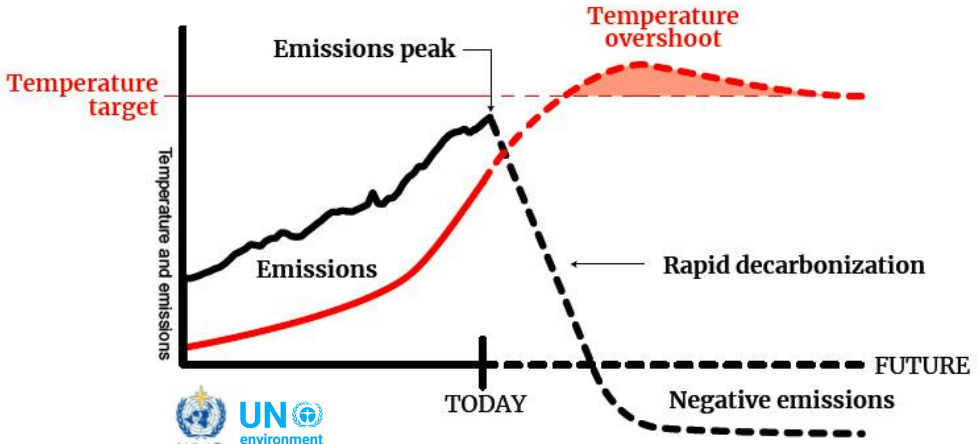

WMO UN environment

What will be CO_2 the goals in Europe? EU goals vs. Paris Agreement (COP 21)

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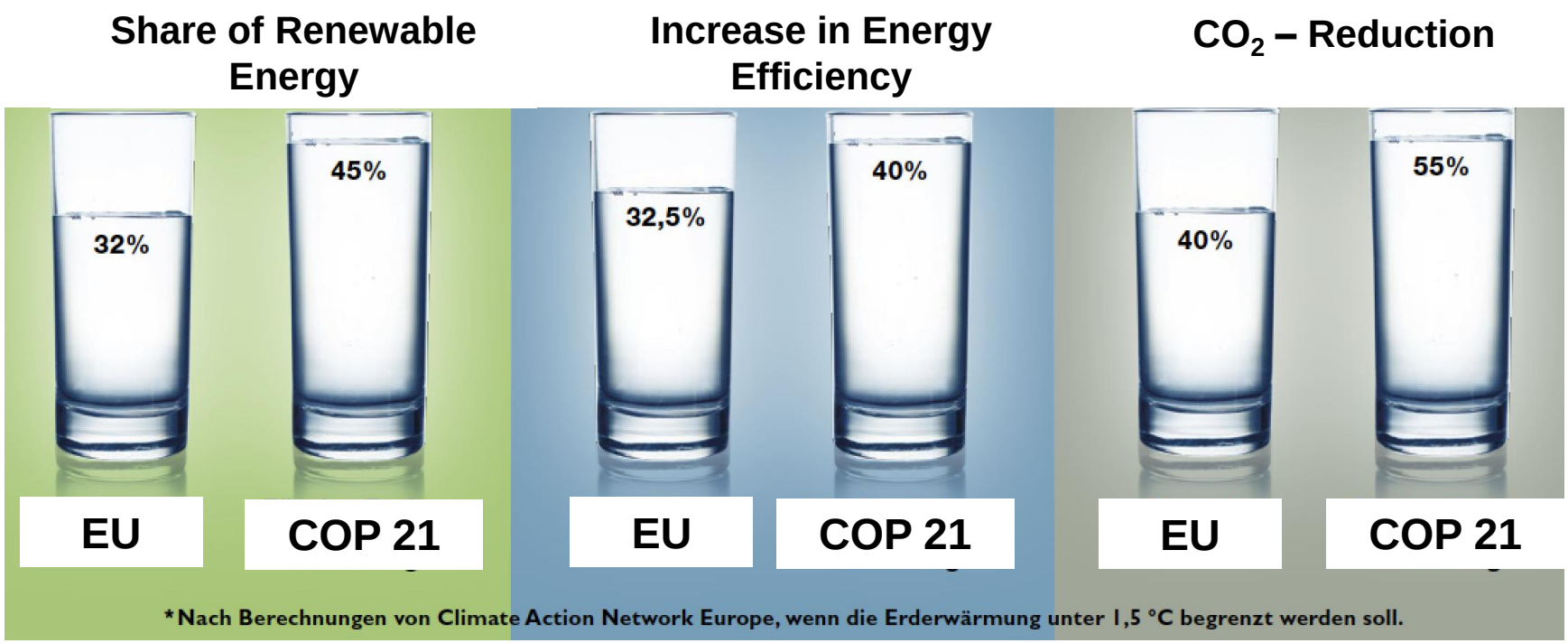

Low CO2 system not more expensive

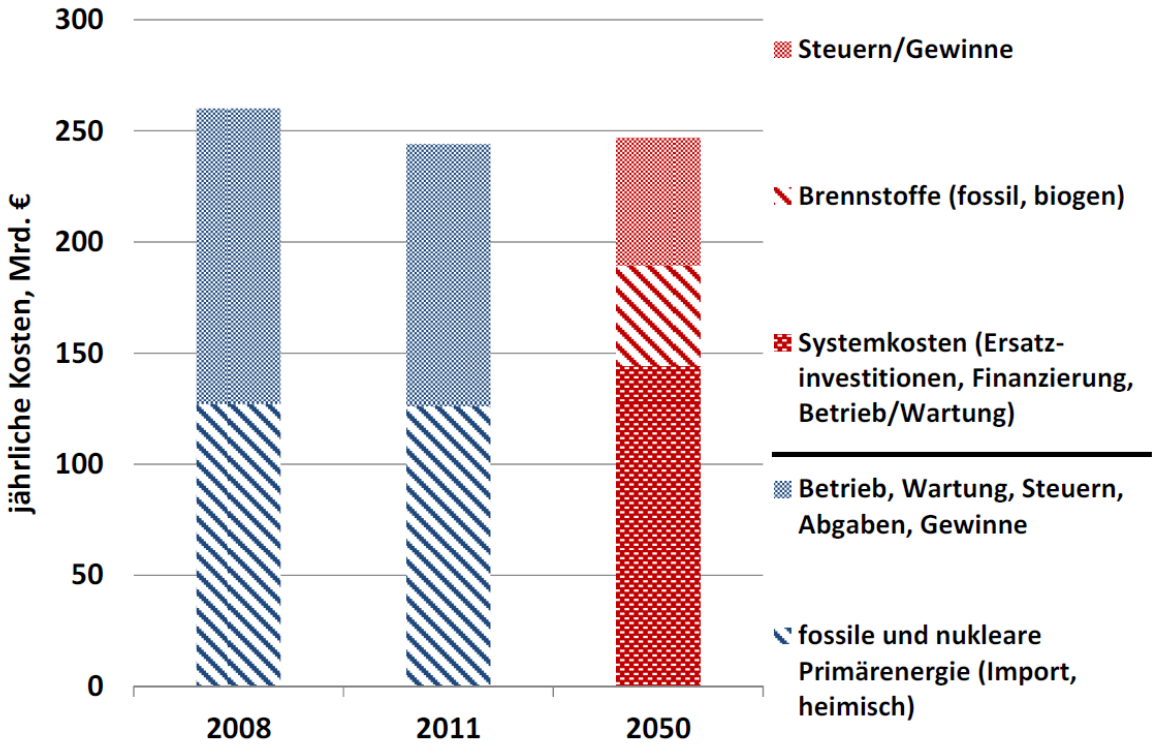

Abb. 44 Vergleich der jährlichen Endverbraucherkosten des deutschen Energiesystems in den Jahren 2008 und 2011 (basierend auf Daten aus [32], [33] (Balken links und Mitte) und für das untersuchte System mit 85 % CO_2-Minderung (Balken rechts)

Im Ergebnis zeigt sich, dass die jährlichen Endverbraucherkosten im Fall des dargestellten Systems mit einer Minderung der energiebedingten CO_2-Emissionen in einem sehr ähnlichen Bereich liegen wie die entsprechenden Werte des heutigen Systems.