„The Energy Transition in Germany after Paris – International and European Perspectives“

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Mercator Kolleg
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available now:

www.mcc-berlin.net/klimabuch
Emissions are rising.
We are not on track.
Does climate policy already show effects?

Data: CDIAC/GCP

CHN 10.4 ▼0.7%
Gt CO₂ in 2015

USA 5.4 ▼2.8%

EU28 3.5 ▲1.4%

IND 2.3 ▲5.2%

Coal 15.0 ▼1.8%

Oil 12.2 ▲1.9%

Gas 6.8 ▲1.7%

Cement 2.0 ▼1.9%

Global Carbon Project

Technische Universität Berlin

MCC
Mercator Research Institute on Global Commons and Climate Change

PIK
Climate Projections and Associated Risks

Level of additional risk due to climate change

- Undetectable
- Moderate
- High
- Very high

Source: Slide by H. J. Schellnhuber
Global non-linear effect of temperature on economic production

Marshall Burke¹,², Solomon M. Hsiang³,⁴,⁵ & Edward Miguel⁴,⁵

Source: Nature, doi: 10.1038/nature15725
Risks from climate change depend on cumulative CO$_2$ emissions...

Based on SYR Figure SPM.10
The climate problem at a glance

Resources and reserves to remain underground until 2100 (median values compared to BAU, AR5 Database)

<table>
<thead>
<tr>
<th></th>
<th>Until 2100</th>
<th>With CCS [%]</th>
<th>No CCS [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td></td>
<td>70</td>
<td>89</td>
</tr>
<tr>
<td>Oil</td>
<td></td>
<td>35</td>
<td>63</td>
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<tr>
<td>Gas</td>
<td></td>
<td>32</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: Bauer et al. (2014); Jakob, Hilaire (2015)
General structure of mitigation pathways

- **Peak in 2020**
- **Steep emissions reduction**
- **Carbon neutrality**
- **Net CO₂ removal**
- **Compensate residual emissions**
- **Compensate budget overshoot**

**Re-directing investments**
from fossils to low carbon and efficiency solutions

**Carbon neutral economy**
Electrification of end uses
Challenges:
- Freight transport, aviation, shipping
- Heavy industry
- Ag emissions (CH₄, N₂O)

LIMITS Study: Kriegler, Tavoni et al., 2013, Clim Change Econ
The global energy system

Baseline

Climate policy
2°C (50% probability)

Primary Energy

Electricity

E/yr

E/yr

Geothermal
Solar
Wind
Hydro
BECCS
Biomass
Nuclear
Gas w/ CCS
Gas w/o CCS
Oil w/o CCS
Coal w/ CCS
Coal w/o CCS
The 2°C budget does not leave any leeway

Cheap and abundant coal is the driver of a „re-carbonisation“ of the energy system in some parts of the world

*All budgets are subject to considerable uncertainty, see Edenhofer et al. (2016)*
840 GW of coal fired capacity is in the pipeline across the globe. >85% is covered by 12 countries.
Renaissance of Coal
Social Costs vs subsidies

“one ton of CO₂ receives, on average, more than 150 US$ in subsidies”

Source: Science, 18 September 2015, Vol 349, Issue 6254, 1286ff
About negative and positive CO$_2$-pricing

Carbon pricing (with taxes or emission trading systems) is essential because of the oversupply of fossil fuels.
Report of the High-Level Commission on Carbon Prices

Joseph Stiglitz and Nicholas Stern
Co-chairs of the Commission

May 29, Berlin, Germany
Results obtained by Stiglitz-Stern-Commission

• Based on the analysis of three approaches: technical roadmaps, national roadmaps, global models

• Necessary carbon price for implementing the Paris Agreement: 40-80 $/t CO₂ until 2020 and 50-100 $/t CO₂ until 2030

• This assumes that carbon pricing will be complemented by activities and policies such as efficiency standards, R&D, urban development, healthy climate for investments, etc.

• Stress on the relevance of the income side. Put to use in order to reduce other taxes, invest in clean infrastructure, etc.

Source: Stiglitz, Stern et al. CPLC (2017)
Carbon Pricing in G20 Countries

2005

Own presentation, based on Worldbank (2016)
ETS lacks dynamic cost efficiency

- Falling CO₂ price
- No increase expected before 2020
- Market Stability Reserve will be implemented, but effect might be limited

Source: ICE Futures Europe
Why emissions in Germany remain the same

Stromerzeugung und daraus resultierende CO₂-Emissionen in Deutschland

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ETS lacks dynamic cost efficiency

- The price expectations for 2020 can serve as a benchmark for the evaluation of the dynamical cost efficiency of the ETS
- There is a gap between expectations and models showing a cost-efficient price of more than 20 €/t CO₂ in 2020

Source: Knopf et al. (2013)
Reasons for concern

- Persistently low EUA price might lead to „hockey stick“ price curve
- Escalating price will induce future downward adjustment of the cap
- Concern over self-fulfilling prophecy

UK experience: Effects of Carbon Price Support Mechanism

Great Britain's annual electrical energy mix

http://tinyurl.com/2018-gb-elec-records

% of electrical energy by fuel source

- %NATURAL GAS
- %NUCLEAR
- %WIND
- %BIOMASS
- %COAL
- %SOLAR

Coal-to-Gas
Switch Range

Prevailing UK
Carbon Price

Prevailing EU
Carbon Price

Average Coal-to-
Gas Switch Price

IEA 2016
Price floor implementation options

Auction reserve price California

Emission Containment Reserve (RGGI)

allowances withheld

allowances withheld
Conclusions

• Unabated climate change will cause high economic costs; the cost of mitigating climate change will be substantially smaller.

• Ambitious climate protection is only possible if an effective carbon pricing is introduced (necessary condition). Transfer payments are a necessary condition for the participation of developed and developing countries in climate protection.

• The EU ETS needs a minimum price: a) to stabilize the expectations of the investors, b) to leave some leeway for EU member states to design their own climate policies.

• In Germany the energy transition can only be successful if the climate protection plan is implemented; an economy-wide policy instrument is needed