Coal Phase-out in Germany & US

Berlin, 21.02.2020

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Coal and Renewables in Germany since 1980

[Graph showing the number of employees and share of produced electricity for different energy sources from 1980 to 2015.]
The carbon lock-in of coal regions and actors originates from various sources

Source: Oei et al. (2019).
The energy system is just one element of a ‘just transition’
ABSTRACT
The administration of U.S. President Donald Trump has promised to stop the ongoing spiralling down of the U.S. coal industry. We discuss the origins of the decline and assess the effects of policy interventions by the Trump administration. We find that, with fierce competition from natural gas and renewables, a further decrease of coal consumption must be expected by the old and inefficient U.S. coal-fired electricity generation fleet. By contrast, we consider the overly optimistic (for coal producers) view of the U.S. Energy Information Agency, and test whether the tide for the U.S. coal industry could turn as a result of three potential support measures: (i) revoking the Clean Power Plan (CPP); (ii) facilitating access to the booming Asian market; and (iii) enhanced support for Carbon Capture, Transport and Storage (CCTS) technology. We investigate the short-term and long-term effects on U.S. coal production using a comprehensive partial equilibrium model of the world steam coal market, COALMOD-World (Holz, Hafendorn, Mendelevitch, & von Hirschhausen, 2016). We find that revoking the CPP could stop the downward trend of steam coal consumption in the U.S., but even allowing for additional exports, will not lead to a return of U.S. coal production to the levels of the 2000s, that is, over 900 Mt per year. When global steam coal use is aligned with the 2°C climate target, U.S. steam coal production drops to around 100 Mt per year by 2030 and below 50 Mt by 2050, even if CCTS is available and exports via the U.S. West Coast is possible.

Key policy insights
- Declining U.S. coal use is primarily caused by competition from natural gas and renewables not by environmental regulation of the coal sector.
- Without substantial policy support, U.S. coal-fired generation capacity will continue to decline rapidly.
- Revoking the Clean Power Plan will lead to about one eighth higher U.S. coal production in the next years.
- Carbon Capture, Transport and Storage does not prevent the rapid decline of coal use required under stringent climate policy.
- Even in the most extreme pro-coal scenarios with additional export possibilities, U.S. coal production will not return to its pre-2010 levels.
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Figure 2. The adaptive cycle. Adapted from [30]
Table 1. Four phases of the adaptive cycle in a regional economy, the poverty trap, and the rigidity trap. Adapted from [6,7].

<table>
<thead>
<tr>
<th>Phase</th>
<th>Characterized by</th>
<th>Potential</th>
<th>Connectedness</th>
<th>Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reorganization</td>
<td>innovation and restructuring</td>
<td>high</td>
<td>low</td>
<td>increasing</td>
</tr>
<tr>
<td>Poverty trap</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>Exploitation</td>
<td>growth and seizing of \ opportunities</td>
<td>low</td>
<td>increasing</td>
<td>high</td>
</tr>
<tr>
<td>Conservation</td>
<td>stability and increasing rigidity</td>
<td>very high</td>
<td>high</td>
<td>decreasing</td>
</tr>
<tr>
<td>Rigid trap</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Release phase</td>
<td>decline and destruction</td>
<td>low</td>
<td>decreasing</td>
<td>increasing</td>
</tr>
</tbody>
</table>

Table 2. Characteristics of the three parameters potential, connectedness, and resilience of the AC [6,7].

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Potential</td>
<td>Inherent potential for change, determines the range of future options (the “wealth” of the system)</td>
<td>Competences and skills in sustainable sectors (e.g., renewable energy), demographic structure</td>
</tr>
<tr>
<td>Connectedness</td>
<td>Internal controllability of a system, reflects the degree of rigidity of controlling variables and processes</td>
<td>Patterns of interdependences among firms in the region</td>
</tr>
<tr>
<td>Resilience</td>
<td>Adaptive capacity, opposite of the vulnerability of the system to unexpected disturbances</td>
<td>Capacity for innovation among firms and institutions, actors' general inclination towards entrepreneurship and the formation of new firms, available investment or venture capital, willingness of workers to re-skill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity for sustainable innovation, R&amp;D expenditures, intensity and personnel</td>
</tr>
</tbody>
</table>
So who is in charge of managing a coal phase-out?

‘Commission on Growth, Structural Change and Employment’

Source: Agora Energiewende (2019).
Composition of the commission

Representatives from interest groups in the commission

- parliament (3)*
- trade unions (3)
- environmental (3)
- energy industry (4)
- business and industry (5)
- regions (7)
- science (5)
- administration (1)

Source: Agora Energiewende (2019).
The ‘coal commission’s’ decision

- 12.5 GW of coal capacity will go offline by 2022, only 17GW remain by 2030 (of currently ~42 GW)
- Phase-out date 2038 with option of early phase-out by 2035
- A total of €40 billion in transition measures in German coal regions for next 20 years
- Costs and conditions for compensating utilities subject to negotiations with the government
- Confirming target of 65% renewable electricity production by 2030
The German Coal Commission: Recommendations and implications

Programme on structural change

- infrastructure (transport, digitization)
- investment support
- innovation (set-up and funding of research institutions in the mining regions, demonstration projects, innovation zones)
- settlement of government agencies (incl. military)
- early retirement/adaptation allowance mechanisms (labour market policies following the blueprint of hard coal mining phase-out)
- civil society and community support programmes

Financial resources for cohesion policies

- €1.3b annually for 20 years for specific measures (controlled by federal legislation), €0.7b annually for 20 years at the disposal of the States
- funds will be only partly additional (mostly re-distribution of existing funding mechanisms)
The German Coal Commission: Recommendations, implications and the broader context

• Electricity price compensation
  – contribution from federal budget to transmission network access fees
  – potentially starting in 2023

• Cancellation of EU ETS emission allowances
  – basic legal EU framework exists, implementation provisions pending, volume to be fixed

• Modernisation of taxes, levies and surcharges and carbon pricing
  – evaluation and revision process need to be started soon
  – major implications for electricity costs, self-consumption, storage, power-to-X

Source: Matthes (2019).
Finding 1: The upcoming coal phase out affects countries differently

Need to differentiate between countries:

- that only mine coal (e.g. Colombia)
  - employment
  - income from exports

- those burning coal (e.g. UK and many countries in Europe)
  - energy security
  - (employment)

- those doing both (e.g. US, China, India, South-Africa, Germany)
  - energy security
  - employment
  - (income from exports)
Finding 2: Political instruments need regional adjustments

- **Financial payments as compensation for a moratorium on new mines and export losses**
  - E.g.: Colombia

- **Support for RES to meet rising energy demand, enable energy access & create jobs**
  - Active & passive labour market instruments to enable a just transition

- **Moratorium on new mines**
  - E.g.: Europe or US

- **Existing coal power plant fleets need to be closed**
  - Support for RES to replace fossil capacities & create jobs

- **Moratorium for new plants to prevent (stranded) assets**
  - E.g.: China or India

- **Support for RES to meet rising energy demand, enable energy access & create jobs**
  - Support for RES to meet rising energy demand, enable energy access & create jobs

- **Active labour market instruments to enable a just transition**
  - Active labour market instruments to create new jobs
Coal Phase-out within most OECD countries is clearly visible

The share of coal is shrinking in OECD Americas and Europe. An uncoupling of coal consumption and GDP growth can be observed.

Coal consumption within OECD Asia Oceania and non-OECD is increasing

Kick-off of Discussions: Open Questions & Further Research

**How to**

- link different interdisciplinary research questions?
- learn from experiences of regional case studies?
- improve cooperation within academia (different research projects and institutions) and practitioners
Renewable Energy potential in coal mining regions

Enabling bottom-up approaches through top-down support

- Top-down framework
- External support
- Bottom-up solutions
Public reactions to climate change vary

The European Green Deal has to become Europe’s hallmark. I want Europe to be the front-runner. I want Europe to be the exporter of knowledge, technologies and best practice. #EUstrivesformore

"At the heart of it is our commitment to becoming the world’s first climate-neutral continent. It is also a long-term economic imperative: those who act first and fastest will be the ones who grasp the opportunities from the ecological transition."

Every bit of climate action matters & how many years do fossil fuels last are we still allowed to burn fossil fuels.

Source: WIR (2018); Berkeley (2019); McGlade & Ekins (2015).
Requirements to future energy markets:
Enable a transition to 100% renewable energy sources

- Support Renewables
- Continue the Energy Transition (batteries, DSM, sufficiency, efficiency)

Phase-out conventional fuels
Phase-in Renewables
Manage „just and timely transition“ of affected regions
Energiewende in Germany – what is needed
Energiewende in Germany – what is happening

Abbildung 1
Zubau von Windenergieanlagen an Land in Deutschland
In Megawatt

Abbildung 4
Genehmigungen von Windenergieanlagen in Bayern und Deutschland 2010–2016
Genehmigte Anlagenleistung in Megawatt pro Landkreis

Source: Stede & May (2019)

Der Ausbau der Windenergie ist zuletzt deutlich zurückgegangen und dürfte absehbar niedrig bleiben.

Anmerkung: Werte für 2019–2021 geschätzt; gezeigt ist der Bruttozubau (ohne Abbau alter Windenergieanlagen).
Quelle: Daten bis 2018 basieren auf Betreiber-Datenbasis; Schätzungen für 2019–2021 basieren auf Fachagentur Windenergie an Land (2019b), a.a.O.

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Mit Inkrafttreten der 10 H-Regelung sind die Genehmigungen in Bayern – anders als im Rest Deutschlands – deutlich eingebrochen.

Anmerkung: Dargestellt sind in Bayern ab dem vierten Quartal 2014 sowohl die Anlagenleistung, die unter Anwendung der 10 H-Regelung genehmigt wurde (orange Linie), als auch die Gesamtzahl aller Genehmigungen (braune Linie). Die gestrichelte Linie zeigt die genehmigte Anlagenleistung, die in Bayern ohne Einführung der 10 H-Regelung erwartet worden wäre.
Quelle: Betreiber-Datenbasis; Anlagenregister; Bayerische Staatsregierung; eigene Berechnungen.

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Requirements to future energy markets: Enable a transition to 100% renewable energy sources

Phase-out conventional fuels
- Get rid of (in-)direct subsidies
- Internalize external costs
- No new conventional plants
- Shut down existing plants

Phase-in Renewables

Manage „just and timely transition“ of affected regions
Many European countries have decided (green) or consider a coal phase-out by 2030 (blue) or by 2035/38 (violet).

Source: Matthes (2019).

Source: Europe beyond Coal (2019).