About the benefits of a CO_2 transport and storage infrastructure in Europe

A coal industry perspective

Dateiname: Rede Dr. Milojcic Draft
Fossil Fuel Forum Berlin 12./13. Oktober 2009
Stand: 29. September 2009

DEBRIV
Bundesverband Braunkohle

EU Council and Parliament resolutions on mitigation of climate change

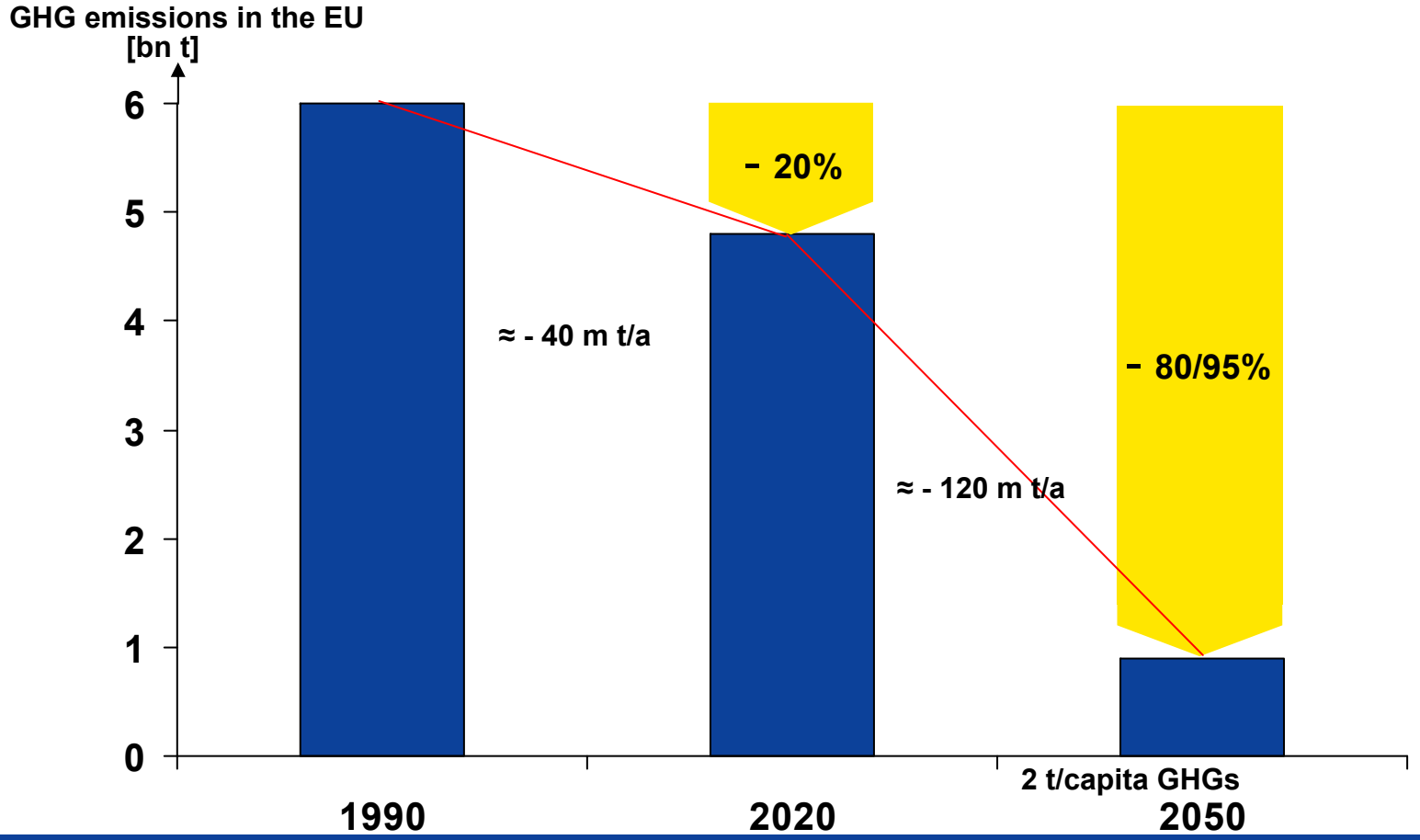
By 2020:

- 20% renewables, 20% energy savings, 20% GHG reduction

By 2050:

- Limiting global temperature rise ≤ 2°C;
  Target value ≤ 450 ppm CO_2 in atmosphere
- Reduction of worldwide anthropogenic GHGs to 50% of 1990 level
- Fair burden-sharing, i.e. industrialized states minimize disproportionately high, i.e. 80 – 95% relative to 1990
- Fairness at ≈ 2 t GHGs per capita and year

Mitigation of climate change in the EU two stages – two speeds



For the EU, this means reducing GHGs from 5.8 bn t/a in 1990 to some 4.6 bn t in 2020 and some 1 bn t/a in 2050.

DEBRIV
Bundesverband Braunkohle

CO_2 reduction in period from 2020 to 2050

Annual reduction rate in GHGs on a scale of ≈ 120 m t/a can no longer be reached by

- increasing efficiency, falling conversion losses, switching fuels

Instead, completely new approaches are needed

- Expansion of wind and photovoltaics must be shaped and designed together with the electricity-storage issue and a robust back-up generation system
- Zero-CO_2 final energy – electricity – for heating market
- new technologies must be launched, e.g.
  - e-mobility, hydrogen?
  - CO_2 capture
  - solar-thermal power plants

Beyond 2020, innovation leaps are required, since the GHG reduction targets can no longer be achieved using today's technology. CO_2 sinks needed.

CO_2 infrastructure as location factor

- The utilization of oil, gas and coal, increasingly after 2020 and – as things stand today – only possible at all in 2050, with carbon capture.
- Security of supply in the electricity sector and industrial production are linked with CCS technology in the medium term already.
- A CO_2 transport and storage infrastructure will be needed after 2015/2020.

The need for carbon capture and a CO_2 transport and storage infrastructure follows from the climate targets and the fact that Central Europe is to remain an industrial region.

Obstacles and possible approaches for a demonstration of CCS

- acceptance – necessity is not recognizable

  ⇒ Decision on national and regional level, CCS one element of solution portfolio from 2020 onwards

- complexity of process chain capture-transport-storage

  ⇒ Separation of tasks where it makes sense, dialogue with industry & power generators

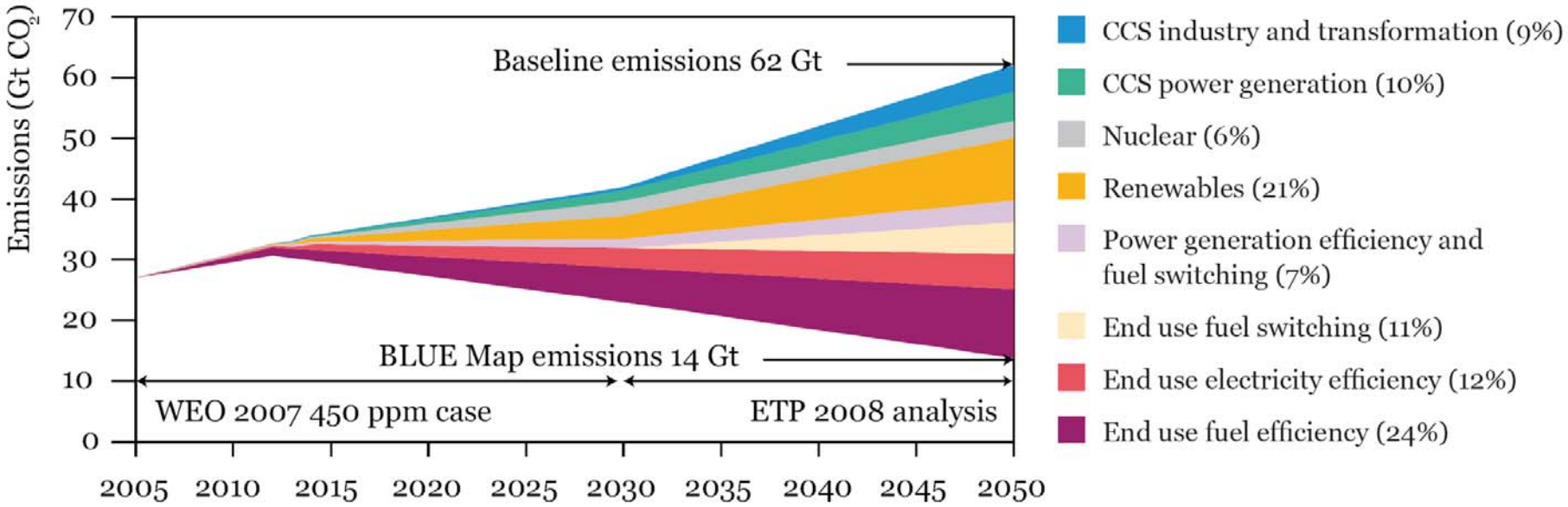
- First Mover – cannot capitalize on development expenses – free-riders profit

  ⇒ Public support for demonstration

- Financing the demonstration of capture and elements of a CO_2-infrastructure

  ⇒ transparent process of granting funds for certain methods, e.g. Oxyfuel, IGCC und post-combustion in power generation, projects in chemical industry/refineries, setup of infrastructure

CCS important contribution to CO_2-mitigation

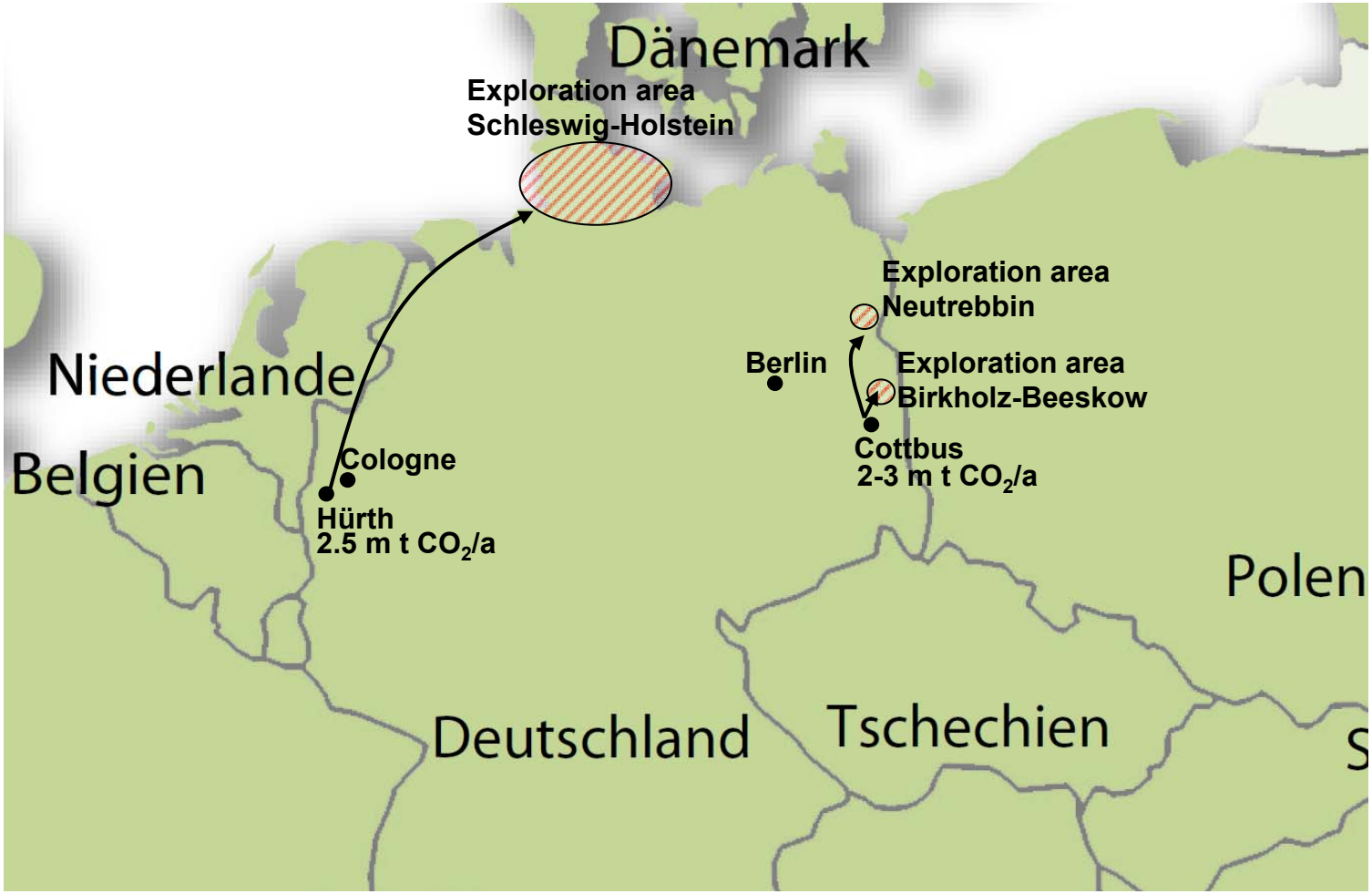


Contribution to 50% emissions reduction by 2050 (BLUE Map Scenario)

Source: IEA Energy Technologies Perspectives 2008

DEBRIV
Bundesverband Braunkohle

Projects in Jänschwalde and Hürth to demonstrate the functioning of the CCS chain: power-plant – transport – storage



In the demonstration projects, regional solutions are possible, but limits are discernible.

DEBRIV
Bundesverband Braunkohle

Major CO_2 sources in Central Europe

	Number of operations > 10 m t/a	Number of operations 10 – 3 m t/a	Number of operations 3 – 0.35 m t/a	Total CO_2 emissions of selected operations, in m t/a
Netherlands	0	10	33	86
Belgium	0	5	33	51
Germany	9	23	153	434
Poland	2	10	56	162
Czech Rep.	0	8	33	74
Total	11	56	308	807

Source: EPER 4/2009 – Data for 2004

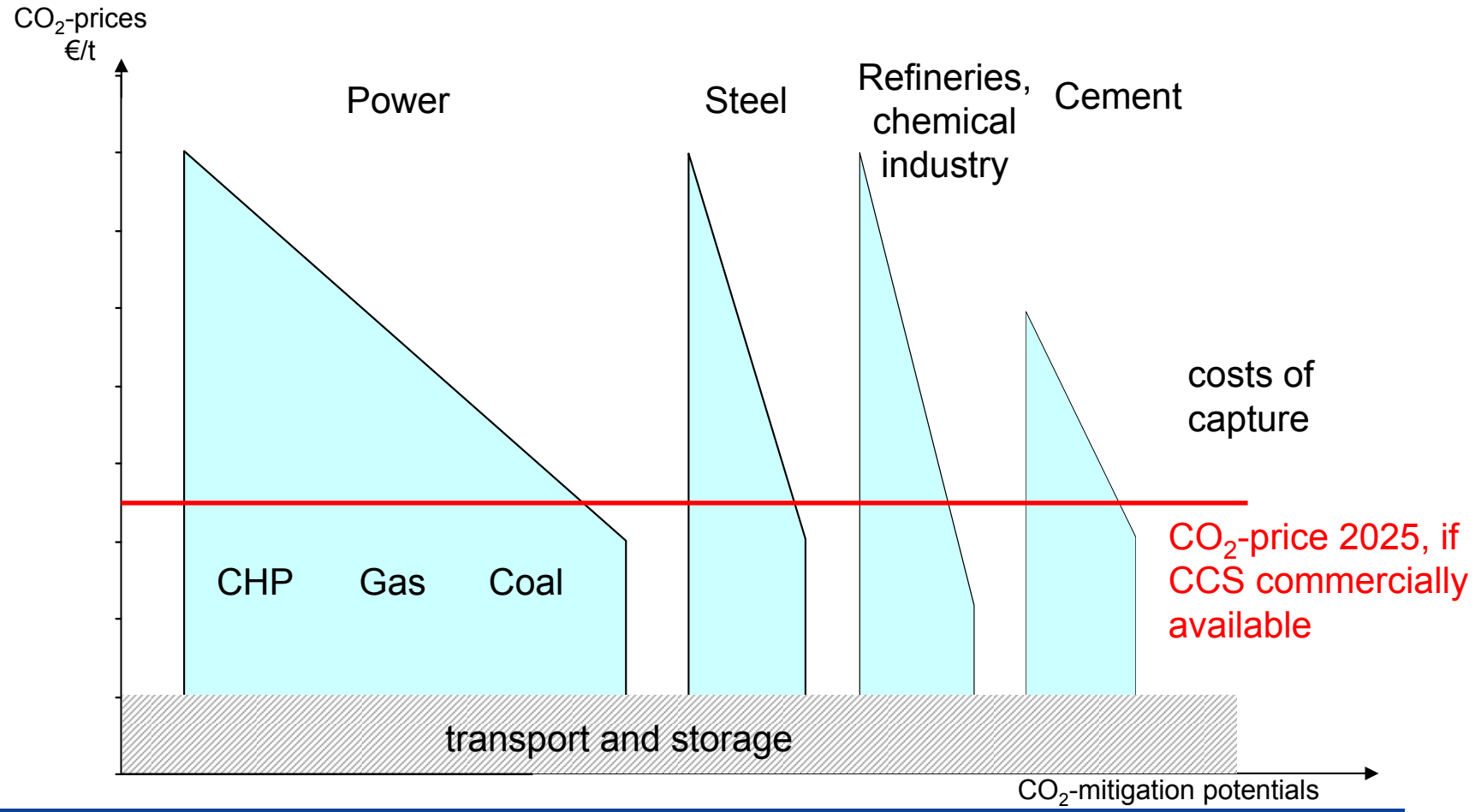
DEBRIV
Bundesverband Braunkohle

Reducing complexity

- CCS-Demonstration as integrated technological process proves to be difficult; lack of concepts for industrial application
- Separation of tasks in industrial-scale application reasonable:
  - Capture conducted by operator of facility:
    - Technology exists, industrial application needs incentives: three processes available in power generation
  - Setup and operation of CO_2 transport- and storage-infrastructure by specialized companies:
    - CO_2-transport tested, acceptance and regulation needed
    - CO_2-storage needs balance of interests between regions and utilization competition

Government action guarantees non-discriminatory access to a CO_2 – infrastructure and ensures sufficiently large capacities in the future

CO_2-infrastructure provides planning reliability as CO_2-prices become calculable (qualitative illustration)



Decision-makers know their costs of capture and are able to estimate the operating expense for transport und storage, if a CO_2-transport-storage-infrastructure is available. With the exhaustion of the cheapest mitigation potentials CO_2-prices rise slowly over time.

DEBRIV
Bundesverband Braunkohle

Why does the demonstration of CCS need public financial support?

- CCS is an innovative technology in competition with established technologies whose development is publicly supported, e.g. large utilities invest in wind power generation

- As electricity is a basic commodity energy companies have little incentive to use **unproven and very costly technology such as CCS**

- Engineering in energy generation is particularly **vulnerable to free-riding** as lessons learnt can be used by all firms

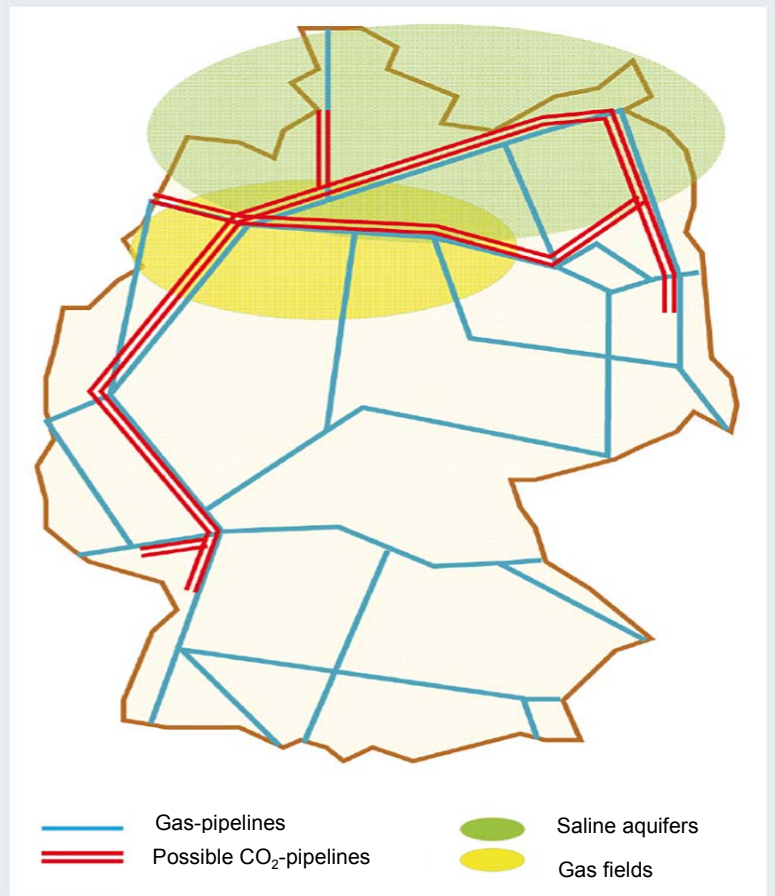
  Due to these market failures investor activity is currently focused on **projects** which are **rather small**.

  They will **help** development of CCS but **not at the pace necessary** for commercial deployment in 2020.

A large number of demonstration projects is needed (EU/ G8 aims) but their development is not market driven

Source: UK DECC, 2009

Build up of a CO_2-infrastructure



Potential CO_2-storage areas, exemplary base structure of a CO_2-transport pipeline system and the gas pipeline infrastructure in Germany (schematic overview)

Source: ET (8) 2009, Dr. Matthes

DEBRIV
Bundesverband Braunkohle

Benefits of CCS-technology

Security of supply and balanced energy mix:

- with CCS coal remains reliable, affordable and domestic contribution to a stable energy supply

- even larger dependence on imported, expensive natural gas can be avoided with use of coal; in the long run gas power stations need CCS as well

- inexpensive back-up system for Renewables

Path towards a decarbonized industry:

- in the near future CCS indispensable for important industries (cement, steel, petroleum processing, chemical industry)

Export potential:

- Leadership in CCS-technology can be used to realize export potential (e.g. in China, India)

Source: CCS Association, DEBRIV